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NORTH AMERICAN TREES

BEING

DESCRIPTIONS AND ILLUSTRATIONS OF THE TREES
GROWING INDEPENDENTLY OF CULTIVATION
IN NORTH AMERICA, NORTH OF MEXICO
AND THE WEST INDIES

BY

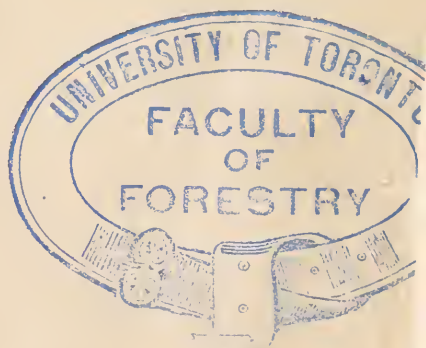
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WITH THE ASSISTANCE OF

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PREFACE



HIS book is designed to describe all the kinds of trees known to grow independently of planting in North America, north of the West Indies and Mexico, and to illustrate them by figures showing the character of foliage, flowers, and fruit; a number of photographs illustrating the general aspect of certain species have also been reproduced by engraving. The drawings have been made with very few exceptions from specimens in the museums or herbarium of the New York Botanical Garden, and the descriptions have been drawn up from these specimens and from field observations. The Jesup collection

METRIC AND ENGLISH MEASURE

Metric Name	Relation to Standard	Abbreviation	English Equivalent	Approximately in English
Kilometer	1000 meters	km.	1093.61 yards .62138 of a mile	$\frac{2}{3}$ of a mile
Meter	Standard	m.	39.37 inches 3.28 feet 1.094 yards	39 $\frac{1}{4}$ inches
Decimeter	$\frac{1}{10}$ of a meter	dm.	3.937 inches	4 inches
Centimeter	$\frac{1}{100}$ of a meter	cm.	.3937 of an inch	$\frac{2}{5}$ of an inch
Millimeter	$\frac{1}{1000}$ of a meter	mm.	.03937 of an inch	$\frac{1}{25}$ of an inch
Micron or micro-millimeter	$\frac{1}{10000}$ of a millimeter	μ	.00003937 of an inch	$\frac{1}{25000}$ of an inch

photographs by Mr. F. C. Beale.

Figures 27, 106, 110, 265, 334, 506, 567, 657, 755, and 762 are from photographs by Dr. Marshall A. Howe.

Figures 32, 129, 139, 145, 148, 149, 205, 207, 211, 212, 214, 216, 234, 245, 333, 335, 336, 340, 345, 350, 351, 357 to 360, 470, 475, 476, 478 to 481, 483 to 489, 491 to 493, 495, 496, 498, 501 to 505, 507, and 540 are from drawings by Mr. A. Meriolle.

Figure 78 is from a photograph by Mr. W. F. Ballou.

Figure 102 is from a photograph by Professor W. M. Wheeler.

Figure 105 is from a photograph by Dr. D. T. MacDougal.

Figure 107 is from a photograph furnished by Professor F. S. Earle.

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While descriptions of trees necessitate the use of some technical terms, it has been sought to reduce these to as small a number as possible, in order that the book shall be available, not alone to persons trained in botany, but to any person of ordinary information; for convenience of use, a glossary of special terms employed is appended.

Trees are woody plants which have a single erect stem or trunk, and this feature distinguishes them from shrubs, which have several or many stems arising from the same roots; some kinds of woody plants fall into both categories, at times developing to a single stem, at others forming several, so they may properly be classified as both, or either, trees or shrubs. As a general rule trees are much larger than shrubs, but there are exceptions, and we have to deal both with small trees and with large shrubs. All species which are known to us to become trees have been admitted, even if they are almost always shrubs.

The relationships of the native and naturalized trees of North America to those of other parts of the world are discussed, and the products of trees useful in the arts, sciences, and industries are mentioned or described.

It is believed that the descriptions and illustrations will render easy the identification of our trees by their foliage, flowers, or fruit.

The illustrations used have been obtained as follows:

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GENERAL KEY TO THE FAMILIES

	PAGE
I. Ovules not enclosed in any ovary but borne naked on the face of a scale.	
Fruit a cone, of many or few scales, berry-like in <i>Juniperus</i>	Class Gymnospermæ. 1
Fruit, in our genera, a fleshy disk partly surrounding a bony seed, or the seed naked.	PINE FAMILY. 3
	YEW FAMILY. 122
II. Ovules enclosed in an ovary.	Class Angiospermæ. 129
A. Embryo with one cotyledon; stem not differentiated into bark, wood and pith; leaves mostly parallel-veined.	Subclass MONOCOTYLE- DONES. 130
Leaves pinnately or palmately compound; ovule 1 in each cavity of the ovary.	PALM FAMILY. 131
Leaves simple, elongated; ovules many in each cavity of the ovary.	DRACÆNA FAMILY. 149
B. Embryo normally with two cotyledons; stem differentiated into bark, wood, and with pith, at least when young; leaves mostly net-veined.	Subclass DICOTYLE- DONES. 161
1. Petals normally separate to the base, or wanting.	
1. Leaves reduced to appressed scales; branches loosely jointed; tropical tree, introduced in Florida.	BEEFWOOD FAMILY. 162
2. Leaves not reduced to appressed scales, though sometimes small or caducous; branches not loosely jointed.	
a. Petals none, except in the pistillate flowers of the Walnuts (<i>Juglans</i>), and in the Olax Family.	
* Calyx none, except in the Walnut Family; flowers, at least the staminate ones, in catkins.	
Leaves simple.	
Fruit many-seeded; seeds with a tuft of hairs at one end.	WILLOW FAMILY. 165
Fruit only one-seeded.	
Stigmas 2.	BAYBERRY FAMILY. 209
Style stigmatic above.	CORKWOOD FAMILY. 213
Leaves odd-pinnate; fruit a nut enclosed in a husk.	WALNUT FAMILY. 215
** Calyx present.	
Leaves odd-pinnate; staminate flowers in catkins.	WALNUT FAMILY. 215
Leaves simple.	
Flowers, at least the staminate ones, in catkins.	
Both staminate and pistillate flowers in catkins.	BIRCH FAMILY. 240

	PAGE
Staminate flowers in catkins; pistillate flowers subtended by an involucre which becomes a bur or a cup in fruit.	BEECH FAMILY. 268
Flowers not in catkins (in catkin-like spikes in the Mulberries); variously clustered or rarely solitary.	
Ovary superior, free from the calyx; flowers mostly imperfect.	
Stamens not adnate to the calyx; flowers regular.	
Sap not milky.	ELM FAMILY. 344
Sap milky.	MULBERRY FAMILY. 361
Stamens adnate to the calyx; flowers irregular.	PROTEA FAMILY. 373
Ovary inferior, at least in part, adnate to the calyx.	OLAX FAMILY. 375
Ovary superior; flowers perfect, regular.	
Stipules united into a sheath.	KNOTWEED FAMILY. 378
Stipules none.	FOUR-O'CLOCK FAMILY. 382
b. Petals present (wanting in the Laurel Family; in the Sweet Gum; in some Prickly Ashes; in the Spurge Family; in some Maples, and in some of the Buckthorn Family, the Chocolate Family and the Hand Tree Family).	
* Ovary superior, free from the calyx (except in the Witch Hazel and Apple Families).	
† Ovary or ovaries simple; sepals mostly separate.	
Stamens numerous; petals present.	
Fruit aggregate, cone-like.	MAGNOLIA FAMILY. 384
Fruit large berries.	CUSTARD-APPLE FAMILY. 394
Stamens 9 or 12, in 3 or 4 series of 3; petals none.	LAUREL FAMILY. 397
†† Ovary compound; sepals separate; stamens hypogynous.	
Leaves simple.	CAPER FAMILY. 405
Leaves pinnately decompound.	HORSERADISH TREE FAMILY. 407
††† Ovary simple or compound; sepals confluent with the concave receptacle (hypanthium); stamens epigynous or perigynous.	
‡ Flowers regular or nearly so.	
Endosperm of the seed usually copious.	
Leaves opposite.	CUNONIA FAMILY. 408
Leaves alternate.	
Corolla and usually the calyx present; ovule one.	WITCH HAZEL FAMILY. 410
Corolla and calyx wanting; ovules many; flowers in dense heads.	SWEET GUM FAMILY. 412
Endosperm none.	
Flowers monœcious, minute, in dense heads.	PLANE TREE FAMILY. 415

Flowers perfect, or, if monœcious or diœcious, not in dense heads.		
Ovaries several, or, if but one, becoming an achene in fruit.		
Ovaries separate, rarely united with the calyx; fruit achenes, follicles or drupe- lets.	ROSE FAMILY.	420
Ovaries united, enclosed by and united with the hypanthium, forming a pome in fruit.	APPLE FAMILY.	426
Ovary one, not becoming an achene in fruit. Leaves simple; ovary with 2 ovules; fruit a drupe.	PLUM FAMILY.	483
Leaves compound; ovary with several or many ovules; fruit a legume.		
Petals valvate in the bud.	MIMOSA FAMILY.	513
Petals imbricated in the bud.	SENNA FAMILY.	533
††Flowers irregular.		
Upper petal enclosed by the lateral ones in the bud; corolla not papilionaceous.	SENNA FAMILY.	533
Upper petal enclosing the lateral ones in the bud; corolla papilionaceous.	PEA FAMILY.	549
†††Ovary compound; sepals mostly sep- arate (more or less united in some of the Buckthorn Family).		
§Stamens few, rarely more than twice as many as the petals.		
Stamens opposite the sepals and of the same number, or fewer; ovules pen- dulous, or erect or ascending.		
¶Ovules pendulous, the raphe toward the axis of the ovary.		
°Petals present, usually as many as the sepals; sap not acrid nor milky; leaves mostly compound.		
Plants without secreting glands; fruit, in our species, a dry capsule.	CALTROP FAMILY.	564
Plants with secreting glands, at least in the bark; fruit various.		
Filaments nearly or quite separate.		
Leaves with pellucid dots.	RUE FAMILY.	567
Leaves without pellucid dots.		
Ovaries more or less united; leaves pinnately compound.		
Sap bitter.	QUASSIA FAMILY.	583
Sap resinous and aromatic.	TORCHWOOD FAMILY.	590
Ovaries separate; leaves simple.	BAY CEDAR FAMILY.	589
Filaments united into a tube.	MAHOGANY FAMILY.	593
°°Petals often wanting; sap acrid, usually milky; leaves simple.	SPURGE FAMILY.	596

		PAGE
¶¶ Ovules pendulous, the raphe away from the axis of the ovary, or erect or ascending.		
Ovary one-celled; sap resinous.	SUMAC FAMILY.	604
Ovary two to several-celled; sap not resinous.		
Leaves pinnately veined, simple.		
Seeds without an aril; ovules one in each cavity of the ovary.		
Flowers racemose, perfect; fruit dry.	CYRILLA FAMILY.	617
Flowers not racemose, mostly imperfect; fruit fleshy.	HOLLY FAMILY.	620
Seeds with or without arils; ovules 2 or more in each cavity.		
Foliage normal; parts of the flowers in 4's.	STAFF TREE FAMILY.	630
Leaves none; parts of the flowers in 5's.	CANOTIA FAMILY.	635
Leaves palmately veined, simple, or compound.		
Leaves opposite.		
Flowers regular.		
Fruit a bladderly capsule.	BLADDERNUT FAMILY.	636
Fruit a pair of samaras.	MAPLE FAMILY.	638
Flowers irregular; fruit a leathery capsule.	BUCKEYE FAMILY.	657
Leaves alternate.	SOAPBERRY FAMILY.	663
Stamens alternate with the sepals; ovules erect.	BUCKTHORN FAMILY.	671
§§ Stamens usually very numerous (few in the Chocolate and Hand Tree Families.		
Sepals valvate; placentæ united in the axis of the ovary.		
Petals present.		
Anthers 2-celled; stamens distinct, or in several groups.	LINDEN FAMILY.	683
Anthers 1-celled; stamens united into a tube surrounding the pistil.	MALLOW FAMILY.	691
Petals none, in our species; stamens united into a tube.		
Fruit, in our species, of separate follicles.	CHOCOLATE FAMILY.	693
Fruit a capsule, 4-or-5 valved.	HAND TREE FAMILY.	695
Sepals or calyx-segments imbricated or convolute; placentæ mainly parietal.		
Sepals separate.		
Stamens united into a tube.		
Placentæ parietal; aromatic plants.	WILD CINNAMON FAMILY.	697
Placentæ axile; resinous plants.	BALSAM TREE FAMILY.	699
Stamens separate.		
Fruit capsular.		
Styles none; leaves small, scale-like.	TAMARISK FAMILY.	701
Styles present; foliage normal.	TEA FAMILY.	703

	PAGE
Fruit a berry; leaves reduced to deciduous scales.	JUNCO FAMILY. 706
Sepals more or less united into a tube.	
Herb-like trees with large lobed leaves.	PAPAYA FAMILY. 708
Fleshy spiny plants with no leaves, or leaves very small.	CACTUS FAMILY. 711
**Ovary inferior, wholly or partly united with the calyx or hypanthium.	
Ovules several or numerous in each cavity of the ovary.	
Cotyledons spirally convolute.	
Ovary several-celled; ovules numerous, not pendulous.	POMEGRANATE FAMILY. 712
Ovary 1-celled; ovules 2 to 5, pendulous.	WHITE MANGROVE FAMILY. 717
Cotyledons not spirally convolute.	
Sepals valvate, leathery.	MANGROVE FAMILY. 714
Sepals imbricated, or united and falling off like a cap.	MYRTLE FAMILY. 723
Ovules 1 in each cavity of the ovary.	
Stamens 5; styles 2 to 5.	GINSENG FAMILY. 733
Stamens 4; style 1.	DOGWOOD FAMILY. 735
2. Petals more or less united into a gamopetalous corolla (essentially separate in the White Alder Family; wanting in many species of <i>Fraxinus</i>).	
1. Ovary superior (except in the Huckleberry and Sweetleaf Families).	
*Stamens mostly free from the corolla, or merely joined to its base, as many as the corolla-lobes and alternate with them, or twice as many, or more.	
Ovary superior; fruit capsular or rarely drupaceous.	
Corolla essentially polypetalous; ovary 3-celled.	WHITE ALDER FAMILY. 748
Corolla gamopetalous (except in <i>Elliottia</i>); ovary mostly 5-celled.	HEATH FAMILY. 750
Ovary inferior; fruit fleshy, a berry or drupe.	HUCKLEBERRY FAMILY. 765
**Stamens borne on the corolla.	
†Stamens opposite the corolla-lobes and of the same number, or twice as many, or more.	
Ovary 1-celled.	
Fruit 1-seeded; staminodes none.	MYRSINE FAMILY. 767
Fruit with several or many seeds; staminodes present	THEOPHRASTA FAMILY. 770
Ovary 3- to several-celled.	
Stamens as many as the corolla-lobes.	SAPODILLA FAMILY. 772
Stamens twice as many as the corolla-lobes.	
Styles and stigmas 2 to 8, separate; flowers imperfect.	EBONY FAMILY. 785
Styles united; flowers mostly perfect.	
Stamens in several series.	SWEETLEAF FAMILY. 789

Stamens in one series.	STORAX FAMILY.	PAGE 791
††Stamens alternate with the corolla-lobes and as many in number or fewer (species of <i>Fraxinus</i> and <i>Forestiera</i> in the Olive Family have no corolla).		
Ovaries 2; stamens mostly joined only to the base of the corolla.		
Stamens fewer than the corolla-lobes, usually only 2, the corolla sometimes wanting; styles short or none.	OLIVE FAMILY.	794
Stamens as many as the corolla-lobes; styles and stigmas united.	DOGBANE FAMILY.	816
Ovary 1, compound; stamens mostly joined to the corolla-tube at or above the middle.		
Fruit drupaceous, or of 4 nutlets or achenes; seeds usually solitary.		
Corolla regular; stamens 5; styles separate or united by pairs.	EHRETIA FAMILY.	818
Corolla irregular; stamens 4; styles distinct.	VERVAIN FAMILY.	824
Fruit a berry or capsule; seeds numerous.		
Corolla regular; stamens 5.	POTATO FAMILY.	828
Corolla irregular; fertile stamens 4, or fewer.		
Seeds not winged; placentæ axile.	FIGWORT FAMILY.	830
Seeds broadly winged; placentæ parietal.	TRUMPET CREEPER FAMILY.	832
2. Ovary inferior.		
Leaves with stipules; foliage usually blackening in drying.	MADDER FAMILY.	840
Leaves without stipules, or with stipules adnate to the petiole; foliage usually not blackening in drying.	HONEYSUCKLE FAMILY.	848

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NORTH AMERICAN TREES

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CLASS GYMNOSPERMÆ

NAKED-SEEDED PLANTS



SEED-BEARING plants (Spermatophyta) form the division of the vegetable world to which all trees except tree-ferns of tropical regions belong. This subkingdom is composed of two classes: (1) Gymnospermæ, or naked-seeded plants, and (2) Angiospermæ, or covered-seeded plants.

The Gymnospermæ have their ovules borne on the face of a scale, and not enclosed in an ovary, and the ovules ripen into seeds which are not enclosed in a pericarp but are usually contained in a cone of one kind or another, the cones of pine-trees or fir-trees being familiar examples. All the Gymnospermæ are woody plants, most of them trees, a few shrubs. The order Pinales, comprising the Pine and the Yew families, is represented by many trees and shrubs of the north temperate zone, most of them evergreens.

Fruit a cone of many or few scales, berry-like in *Juniperus*.

PINE FAMILY.

Fruit, in our genera, a fleshy disk partly surrounding the bony seed, or the seed naked.

YEW FAMILY.

THE PINE FAMILY

PINACEÆ LINDLEY



THIS family consists of about 25 genera with some 250 species of trees and shrubs widely distributed in temperate regions throughout the world; they are of especial economic value on account of their soft wood and furnish some of the most extensively used lumber. This is largely due to the structure of the wood, which differs markedly from that of the deciduous-leaved trees in being more uniform; there are fewer large pores and less conspicuous medullary rays.

The resinous sap, which is present in all parts of these plants, collected from many species and by different methods, is the source of a variety of resins, turpentine, tars, and pitches; the last two are considerably altered products owing to the process of extraction by various forms of destructive distillation. Essential oils are also secured from a number of them, usually from the leaves and young twigs or cones, or in some instances from the wood. These are used in the arts and in medicine. The large seeds of some pines of the northern hemisphere and those of *Araucaria imbricata* Pavon, of South America, are nutritious and of considerable importance as food. The astringent barks of many different species are of great importance in tanning.

The Pinaceæ have either scaly or naked buds; their leaves are usually persistent, narrow or needle-like, or flat or scale-like, alternate, whorled, opposite or clustered. The flowers are naked, there being no enclosing parts surrounding the ovules or pollen-sacs, which are borne on the faces of scales, and these are aggregated in catkin-like clusters, the pollen and ovules in separate catkins. The ovules develop into seeds between the scales. The pistillate catkins grow into various forms of dry or fleshy cones, constituting the fruit and from which the seeds are liberated by the spreading of the scales, except in the berry-like fruits of the Junipers where these are united into a fleshy mass. The seeds are winged or wingless; the endosperm is fleshy, mealy, or starchy, often resinous; the embryo is straight; the cotyledons vary from 2 to 12, or more. The genera in our area are:

Fruit dry, a simple cone.

Scales of the cone numerous (or few in *Larix*); leaf-buds scaly.

Cone-scales thick, woody; leaves needle-shaped, 2 to 5 in a sheath

1. *Pinus*.

Cone-scales thin; leaves linear or filiform, fascicled or scattered.

Leaves fascicled on very short branchlets, deciduous.

2. *Larix*.

Leaves scattered, persistent.

Leaves jointed to short persistent woody stalks or sterigmata.

Leaves 4-sided.

3. *Picea*.

- Leaves flat.
 Leaves not jointed to woody stalks.
 Cones pendulous, their scales persistent after maturing.
 Cones erect, their scales falling away from the axis.
 Scales of the cone few; leaf-buds naked (except in *Taxodium*, a species of *Sequoia* and some species of *Juniperus*).
 Cone-scales spiral, thick.
 Leaves persistent; cones oblong.
 Leaves deciduous; cones globose.
 Cone-scales opposite.
 Cones ovoid to oblong, their scales thin.
 Cone-scales 6; seed unequally winged.
 Cone-scales 8 to 12; seed equally winged.
 Cones globose, their scales thick.
 Cones large, maturing the second year; seed narrowly winged; twigs quadrangular.
 Cones small, maturing the first year; seed broadly winged; twigs flattened.
 Fruit fleshy, a modified cone, berry-like.
4. *Tsuga*.
 5. *Pseudotsuga*.
 6. *Abies*.
 7. *Sequoia*.
 8. *Taxodium*.
 9. *Heyderia*.
 10. *Thuja*.
 11. *Cupressus*.
 12. *Chamaecyparis*.
 13. *Juniperus*.

I. THE PINES

GENUS **PINUS** [TOURNEFORT] LINNÆUS



THIS genus consists of evergreen trees, a few of which are reduced to shrubs at high altitudes or high latitudes. They are apparently confined to the northern hemisphere and represented by nearly 100 species, of which fully one third are natives of North America.

They are of great economical importance. The wood of some species, especially that of the white pines, is valued on account of its evenness, softness, and the ease with which it can be worked; the harder, resinous woods of the pitch pines or yellow pines are also used to a very large extent and are more durable in contact with the ground. The resinous juice is of great importance in the arts, being the source of the so-called oil or spirits of turpentine which is secured from the juice by distillation, the residue constituting commercial resin. Tar is produced by a more or less crude process of destructive distillation of pine wood, the residue being charcoal. Tar when subjected to distillation yields oil of tar and a thick residue called naval pitch; all these products are used to a greater or less extent in medicine; volatile oils are also obtained from various species of pine leaves, young shoots or young cones, and have some specific application in medicine. The fiber from some of the long leaves of pines is sometimes extracted for special applications. The large seeds, especially notable in the group called nut pines, are very nutritious and are an important article of food, especially to the Indians of the southwestern United States and Mexico; also in southern Europe where the seed of the stone pine is of much importance. As ornamental trees the pines are too well known to require more than mention here.

This genus was probably more abundantly represented in former geologic times than now, as there are numerous representatives known in the fossil remains of the Cretaceous and Miocene formations. Amber is a fossil resin produced by some member of this genus, or of one closely allied to it.

The pines have two kinds of leaves, the primary, which soon disappear and are seldom seen except on seedlings or on vigorous sprouts sometimes growing from stumps or injured trunks; they are deciduous, linear, more or less flat or sometimes scale-like. The secondary or ordinary foliage-leaves persist for at least two years in fascicles of 2 to 5 or 7, subtended by the bud-scales, and in many species portions of these are united to form a sheath around the base of the fascicle; rarely there is but one leaf; they are stiff-pointed, usually minutely toothed, semicircular or triangular in cross-section; they have stomata on 1 face or all, and 1 or 2 fibrovascular bundles. The flowers usually appear in spring, the staminate and pistillate ones mostly in separate clusters (monœcious) or rarely both kinds in the same cluster (androgynous), the staminate usually oval or cylindric, composed of many sessile, 2-celled anthers. The pistillate flowers are nearly terminal, or lateral, solitary, in pairs or often in clusters, erect or recurved, sessile or stalked, consisting of many carpellary scales, accompanied by small bracts, spirally arranged and bearing at the base of their inner surface 2 naked inverted ovules. The fruit is a cone, maturing usually at the end of the second season, opening and shedding its seed at maturity, in some species persistent on the branches for many years. The cone-scales are elongated, and variously thickened and appendaged at the exposed apex. The seeds are borne in pairs at the base of the scales, often winged, their coating more or less crustaceous; cotyledons 3 to 15, rarely more.

The name is the ancient name of a pine tree. The so-called Scotch pine, *P. sylvestris* L., of Europe, is the type species.

A. Leaf-sheaths loose, falling away early.

Cone-scales without spines.

Wing of the seed large; White pines.

Leaves slender, pale green, eastern tree.

1. *P. Strobus*.

Leaves stiff, green; western trees.

Cones 1.2 to 2.7 dm. long.

2. *P. monticola*.

Cones 3 to 4.5 dm. long.

3. *P. Lambertiana*.

Wing of the seed much shorter than the body.

Leaves slender; cone-scales reflexed.

4. *P. strobiformis*.

Leaves stiff; cone-scales not reflexed.

Cone-scales brown, spreading, their tips merely pointed.

5. *P. flexilis*.

Cone-scales purple, remaining closed, their tips triangular.

6. *P. albicaulis*.

Wing of the round seed minute; Nut pines.

Leaves slender; bark very scaly.

7. *P. cembroides*.

Leaves stout; bark not scaly or but little so.

Leaves usually in 4's, sometimes 3 or 5; tree of southern and Lower California.

8. *P. quadrifolia*.

Leaves 1 to 3 in each fascicle.

- Cones 3 to 6 cm. long; leaves 2.5 to 6 cm. long. 9. *P. monophylla*.
 Cones 2.5 to 4 cm. long; leaves 2 to 4 cm. long. 10. *P. edulis*.
 Cone-scales armed with slender spines.
 Spines of the cone-scales short.
 Cones ovoid; leaves in 3's, 6 to 10 cm. long. 11. *P. chihuahuana*.
 Cones nearly cylindric; leaves in 5's, 2 to 4 cm. long. 12. *P. Balfouriana*.
 Spines of the cone-scales long and slender, leaves in 5's. 13. *P. aristata*.
 B. Leaf-sheaths persistent, embracing the leaves at the base.
 a. Cones subterminal.
 Leaves in 5's (sometimes in 3's in No. 15); western trees.
 Leaves 2.2 to 3.3 dm. long; cones ovoid, 1 to 1.5 dm. long. 14. *P. Torreyana*.
 Leaves 1.2 to 1.8 dm. long; cones oval, 5 to 6 cm. long. 15. *P. arizonica*.
 Leaves in 2's or 3's.
 Cone-scales unarmed; eastern tree. 16. *P. resinosa*.
 Cone-scales armed.
 Cones oval to oblong-oval; resin-ducts of the leaves near the surface; western trees.
 Spines of the cone-scales stout; cones 7 to 15 cm. long.
 Leaves 1.3 to 4 dm. long; cones 7.5 to 15 cm. long. 17. *P. ponderosa*.
 Leaves 0.7 to 1.5 dm. long; cones 11 cm. long or less. 18. *P. scopulorum*.
 Spines of the cone-scales slender; cones oblique, 2 to 5 cm. long.
 Leaves dark green, 2.5 to 5 cm. long. 19. *P. contorta*.
 Leaves yellow-green, 5 to 7.3 cm. long. 20. *P. Murrayana*.
 Cones long-conic; resin-ducts of leaves away from the surface. 21. *P. palustris*.
 b. Cones lateral (or subterminal in *P. caribæa*).
 1. Leaves in 3's, or sometimes in 2's in *P. echinata* and *P. caribæa*.
 Eastern trees.
 Cones ovoid, globose, or broader than long.
 Leaves 12 cm. long or less; cone-scales with stiff prickles. 22. *P. rigida*.
 Leaves 15 to 20 cm. long; cone-scales with small slender deciduous or obsolete prickles. 23. *P. serotina*.
 Cones conic or conic-cylindric.
 Leaves 13 cm. long or less; cones less than 7 cm. long. 24. *P. echinata*.
 Leaves 15 to 30 cm. long; cones 1 to 2.5 dm. long.
 Cone-scales with sharp recurved spines; resin-ducts in leaf near the surface. 25. *P. Tæda*.
 Cone-scales with short slender spines; resin-ducts in leaf not near the surface. 26. *P. caribæa*.
 Western trees.
 Cone-scales with stout spines.
 Cones 1.5 to 3.5 dm. long; spines very stout.
 Leaves drooping; cones 1.5 to 2.5 dm. long, their spines upright or curved outward. 27. *P. Sabiniana*.
 Leaves erect; cones 2.5 to 3.5 dm. long, their spines curved inward. 28. *P. Coulteri*.
 Cones 7 to 13 cm. long; spines triangular. 29. *P. attenuata*.
 Cone-scales with minute incurved spines. 30. *P. radiata*.
 2. Leaves all in 2's.
 Eastern trees.
 Spines of the cone-scales short, deciduous, or obsolete.
 Cones ovoid to globose, straight; southern tree. 31. *P. glabra*.

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|---|----------------------------|
| Cones conic, much incurved; northern tree. | 32. <i>P. Banksiana.</i> — |
| Spines of the cone-scales well developed. | |
| Cones 4 to 7 cm. long. | |
| Twigs not glaucous; leaves slender, 1 mm. thick. | 33. <i>P. clausa.</i> |
| Twigs glaucous; leaves stout, 1.5 to 2 mm. thick. | 34. <i>P. virginiana.</i> |
| Cones 10 to 13 cm. long, globose or depressed; scales with hooked spines. | 35. <i>P. pungens.</i> |
| Western tree; cone-scales with short incurved spines. | 36. <i>P. muricata.</i> |

1. WHITE PINE — *Pinus Strobus* Linnaeus

The White pine, or Weymouth pine, is the most valuable forest tree of eastern North America, and one of the most beautiful of conifers. It occurs from Newfoundland to Ontario and Manitoba, south, near the Atlantic coast to east-central New Jersey, along the Alleghany Mountains to Georgia and eastern Tennessee, and to Illinois and Iowa. It prefers the moist loose soil of hillsides and mountain slopes, occasionally, however, growing in quite swampy situations. The tree attains a maximum height of about 80 meters, with a trunk sometimes 2 meters in diameter.

The bark of old trees is very thick and fissured, that of young trees much thinner, smooth, or nearly so, green or reddish. The young twigs are somewhat velvety, but soon become smooth and brown. The buds are pointed and about 1 cm. long. The leaves are 5 in each sheath, very slender and flexible, pale green or bluish green, 7 to 12 cm. long; their sheaths are loose, composed of several nearly separate scales, and fall away soon after the leaves are grown. The staminate flowers are numerous, borne laterally on the lower part of shoots of the season, oblong, blunt, yellow, and about 1 cm. long, subtended by several scales. The pistillate flowers are stalked, usually several together at the ends of the shoots, and at flowering time in June are about 7 mm. long. The cones ripen in the summer of the second season, when their scales open and release the seeds; they are stalked, drooping, cylindric, pointed, resinous, 10 to 15 cm. long and about 2.5 cm. thick, their scales are slightly thickened and blunt at the apex, otherwise thin, without any spine or prickle; the seeds are about 2 cm. long, the terminal wing three or four times as long as the body. The cones usually fall from the tree during the winter after the seeds are released.



FIG. 1. — White Pine.



FIG. 2. — White Pine in New York Botanical Garden.

The lumber of the White pine is used in great quantities in almost all kinds of construction, and for woodenware, boxes, and matches. The wood is nearly white, soft, easily worked, not very resinous, with a specific gravity of about 0.38. The commercial supply has been much reduced by extensive cutting of the forests, and many attempts are being made to grow the tree on a large scale. Its growth is quite rapid, and the tree is highly esteemed for lawn and park planting, but, like

most other conifers, it does not thrive in the smoky air of dense cities. The name Weymouth pine was given to the tree in England, because it was planted by Lord Weymouth in Wiltshire, early in the eighteenth century; it is also called Soft pine and Northern pine.

✓2. WESTERN WHITE PINE — *Pinus monticola* Douglas

This pine very closely resembles the eastern white pine, and was regarded as a variety of it by Nuttall, but its differences from that species appear to be constant. It reaches a maximum height of about 50 meters, with a trunk sometimes nearly 3 meters thick, and occurs from northern Montana to southern British Columbia, southward to the mountains of south-central California.

The thick bark of old trees is fissured into nearly square plates; that of young trees is gray, smooth, or nearly so. The young twigs are stout and brown-hairy, becoming smooth and reddish. The leaves are 5 in each sheath, stout and stiff, bluish green, 10 cm. long or less, their sheaths loose, 1 to 2 cm. long, early falling away. The staminate flowers are numerous, borne on the sides of shoots of the season, 1 cm. long or less; the pistillate flowers are terminal and stalked. The ripe cones are 1.2 to 2.7 dm. long, and 4 to 5 cm. thick, thus much larger than those of *Pinus Strobus*; they are pendulous, pointed, and their scales open to shed the seeds in the summer or autumn of the second season; the cones fall away from the tree in the following winter or spring; the scales are slightly thickened near the tip, otherwise thin, short-pointed, without any spine or prickles; the seeds are about 2.5 cm. long, the thin wing three or four times as long as the oblong body.

The tree is of slower growth than its eastern relative; its wood is nearly white, soft and easily worked, has a specific gravity of about 0.39 and is used in construction work. It is also known as Silver pine, Finger-cone pine, Mountain pine, Little Sugar pine and Soft pine.



FIG. 3. — Western White Pine.

3. SUGAR PINE — *Pinus Lambertiana* Douglas

This, the largest of all pines, inhabits mountain sides and cañons, occurring from Oregon southward through California to central Lower California. Toward the northern limit of its range it sometimes attains a height of 70 meters or some-

what more, with a trunk up to 4 meters in diameter; trees of even larger dimensions than these are said to have existed at the time the species was discovered by Douglas in southern Oregon.

The bark of old trees is fissured into long plates, brown to red-brown and 5 cm. thick or more; that of young trees is smooth, much thinner and gray. The stout young twigs are somewhat hairy, becoming smooth and brown. The leaves



FIG. 4. — Sugar Pine.

are 5 in each cluster, stout, toothed, at least above the middle, dark green and about 1 dm. long; the sheath of the clusters falls away early. The oblong staminate flowers are blunt, numerous, 1 to 1.5 cm. long. The pistillate flowers are terminal, usually 2 or more together. The ripe cones are very large, 3 to 4.5 dm. long, pendulous, 7 to 9 cm. thick while the scales are closed, and shed their seeds in the autumn of the second season, falling away from the tree during the third

year; the cone-scales are about 5 cm. long, blunt, slightly thickened at the tip, but without any spine or prickle; the seeds are 12 to 15 mm. long, the blunt and rather broad wing somewhat longer than the body.

The wood of the Sugar pine is largely used for shingles, barrels, utensils, and in construction. It is light brown, soft, easily worked, not very strong, with a specific gravity of about 0.37. The tree is also called Big pine, Shade pine and Great Sugar pine.

4. MEXICAN WHITE PINE — *Pinus strobiformis* Engelmann

This tree inhabits cañons and mountain sides in Arizona, New Mexico and Chihuahua, reaching a height of about 30 meters, with a trunk 6 dm. in thickness. Its branches are slender and somewhat drooping.

The bark is thick, deeply fissured, brown to reddish brown. The young twigs are somewhat reddish hairy, becoming smooth, and sometimes covered with a bloom. The leaves are in clusters of 5, slender, but rather stiff, light green, very minutely toothed, 10 cm. long or less; their sheaths become 2 to 2.5 cm. long, and fall away early. The tree flowers in May or June; the oblong staminate flowers are 8 or 10 mm. long; the pistillate flowers are terminal, usually two or more together. The cones ripen during the summer of the second year, when they are oblong, pendulous, 1.2 to 2.3 dm. long, about 4 cm. thick; their scales are thin, about 3 cm. long, with blunt reflexed tips devoid of any spine or prickle; the seeds are oval, a little flattened, 1 to 1.5 cm. long, the thin blunt wing only about 3 mm. long.

The wood is hard, strong, reddish white, with a specific gravity of about 0.49, and furnishes a valuable timber, as yet little used. It is also called Arizona White pine.

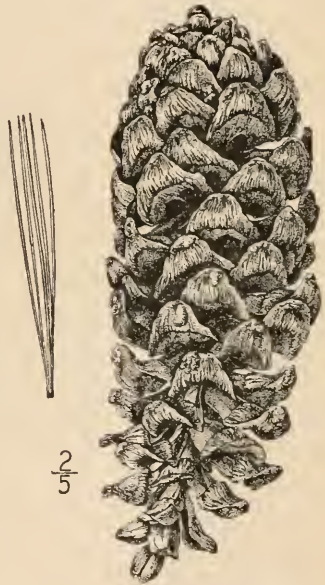


FIG. 5. — Mexican White Pine.

✓ 5. ROCKY MOUNTAIN WHITE PINE — *Pinus flexilis* James

This Rocky Mountain tree is also known as Bull pine, Limber pine, White pine, and Rocky Mountain pine; it occurs at altitudes of from 1500 to 3600 meters from Alberta southward to western Texas and southeastern California, varying greatly in size, and in the shape and size of the cones. Its maximum height is 15 meters, with a trunk diameter up to 1.5 m. The tree of the south, having very long, more slender cones and sometimes minutely toothed leaves, is the *Pinus flexilis megalocarpa* of Sudworth.

The trunk is stout; its branches are stout, persisting and spreading, forming

a conic head, but in old age it is more rounded in outline. The bark of old trees is 2.5 to 5 cm. thick, deeply fissured into broad ridges and square, dark brown to nearly black scaly plates; on younger stems it is simply scaly and lighter in color. The twigs are very tough and flexible, light orange-colored, softly hairy, soon becoming smooth and darker, sometimes purple and covered by loose, dryish



FIG. 6. — Rocky Mountain White Pine.

brown scales; the terminal buds are about 12 mm. long, twice the length of the lateral ones. The leaves are in fascicles of 5, without permanent sheaths, stout and stiff, about 5 cm., rarely 9 cm. long, and entire, or in a southern form, slightly toothed near the apex, marked on the upper faces with 1 to 4 rows of stomata and contain 2 resin-ducts and a single

fibrovascular bundle; they form tufts at the ends of the twigs and persist for about six years. The flowers appear late in June, the staminate in clusters at the end of the twigs; they are oval, about 12 mm. long, their anthers reddish. The pistillate flowers are in nearly terminal clusters of 2 or 3, nearly sessile, about 12 mm. long, bright reddish purple and subtended by persistent, dryish brown bracts. The cones, growing rapidly the second summer, have fully matured by September, when they are horizontal or slightly declined, stout-stalked, oval or nearly cylindric, 7.5 to 25 cm. long, about 4 cm. thick, light brown, shedding the seeds and usually falling off before winter; their scales are thin, usually broad and rounded with a thickened darker knob, scarcely reflexed at the apex, the basal ones sterile, narrower and much reflexed, the unexposed portion dull reddish brown. Seeds oval, compressed, 8 to 12 mm. long, dark reddish brown and mottled, the margin narrow, the wing thin, dull, about 12 mm. wide, remaining attached to the cone-scale, the seed falling away from it; cotyledons 6 to 9.

The wood is soft, close-grained, pale yellow or reddish on exposure; its specific gravity is about 0.43; it is used in the southern part of its range for construction, but is not as good as that of *Pinus Strobus*, being very knotty.

6. WHITE BARK PINE — *Pinus albicaulis* Engelmann

A rather small tree of alpine habitat, occurring at altitudes of 1500 to 3600 meters, in the high mountains of British Columbia southward to the San Bernardino Mountains of southern California, eastward to Montana and Wyoming. Its

maximum height is 18 meters, with a trunk diameter of 1.2 meters, but it is often reduced at the highest altitudes to a spreading shrub.

The branches are stout and flexible, in regular whorls forming a compact cone; very old trees are often irregular and round-headed. The bark is about 12 mm. thick, narrowly fissured into light brown or whitish scales, which on falling expose a reddish inner layer; on younger stems it is much thinner and almost white. The twigs are stout, smooth or nearly so, except for the persistent bud-scales, orange-colored or dark reddish brown. The branch-buds are broadly ovate, sharp-pointed and covered by loosely imbricated pale brown scales; they are 12 mm. long, or the lateral ones much smaller. The leaves are in fascicles of 5, the sheaths soon disappearing; they are dark green, stout and stiff, slightly curved, 4 to 7.5 cm. long, sharply

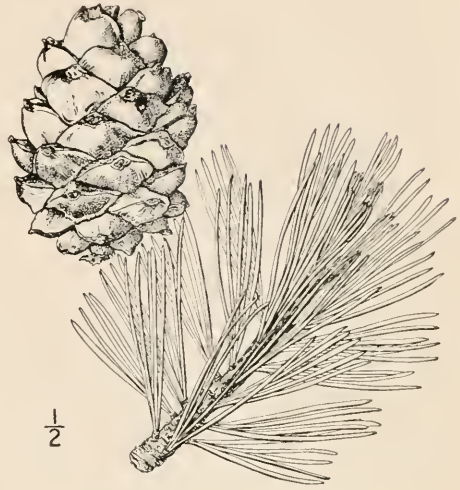


FIG. 7. — White Bark Pine.

stiff-pointed and entire, marked with 1 to 3 rows of stomata on the upper faces and contain 2 resin passages and a single fibrovascular bundle; they are crowded at the ends of the otherwise naked branches and persist for five to eight years. The flowers open in July, the staminate, in short spike-like clusters surrounding the ends of the twigs, are oval, about 10 mm. long, their anthers scarlet. The pistillate flowers are oblong, about 8 mm. in diameter and sessile, clustered at the apex of the twigs, their scales bright scarlet. The young cones grow very slowly the first season, but more rapidly the second summer, becoming horizontal and mature by the end of September, oval or subglobose, 8 to 10 cm. long and purple; they seldom open, but remain closed for some time, after which they break up; the ends of the much thickened scales gradually taper and contract on both sides into a sharp edge and terminate in a stout, irregular, somewhat incurved darker tip. The seeds are ovate-subcylindric, sharp-pointed, sometimes flattened on one side, 8 to 12 mm. long, dark brown and hard, the margin a narrow border; wing very thin, light colored and very narrow, remaining attached to the cone-scales when the seed is liberated; cotyledons 7 to 9.

The wood is soft, brittle, close-grained and light brown; its specific gravity is about 0.42.

The seed is sweet and is a favorite food for the birds of the region, especially the crow, who tears the cones to pieces before they are quite ripe, to get at the young seeds; the Indians also gather them for food.

This pine has received many names, among them White stem pine, Scrub pine, Pitch pine, White bark, Creeping pine, Alpine white pine, and Alpine white bark pine.

7. MEXICAN NUT PINE — *Pinus cembroides* Zuccarini

A low bushy tree of Arizona and adjacent Mexico, occurring on dry mountain ridges at an altitude of about 1900 meters. Its usual height is about 6 meters, with a trunk diameter of 3 dm. It is reported to attain much greater dimensions in Mexico and is variously known as Mexican piñon or pinyon, Nut pine, Piñon and Stone pine; it is recorded as growing also in Lower California.

The trunk is short, its bushy branches forming a broad round head. The bark is about 12 mm. thick, irregularly and remotely fissured into broad plates which are covered by thin, light reddish brown scales. The twigs are slender, dark yellow, becoming black; they are covered with pale matted hairs. The large conspicuous bud-scales soon disappear. The branch-buds are about 6 mm. long, tapering to a sharp point, the scales brown and shining, ovate, acute or long-tipped. Juvenile leaves of this and the other nut pines are produced for the first five years or more, often to the exclusion of all others; they are flat, linear-lanceolate, strongly keeled and glaucous, entire, 18 to 25 mm. long, the new ones shorter as the buds of the fascicled needle-shaped leaves develop in their axils. The older leaves are in fascicles of 2 or 3, with a deciduous sheath, dark green, slender, 2.5 to 5 cm. long, much curved, their tips elongated and thickened; they are marked by 4 to 6 rows of stomata on each ventral face and contain 2 dorsal resin-ducts and a single fibrovascular bundle; they are crowded at the ends of

the branches and persist for three or four years. The staminate flowers are dense oblong or oval, 6 mm. long, the anthers yellow. The pistillate flowers are lateral and erect on stout stalks, oblong, about 3 mm. long, their scales thick and dark red. The cones become about 12 mm. long by the end of the first season, growing rapidly the second season, and by autumn have become subglobose, 3 to 5 cm. in diameter, short-stalked, light reddish brown; the scales are concave, rounded or sharp at the apex, thickened and ridged with a darker central concave knob, that of the lower scales reflexed. The central scales only bear the seeds, the others are sterile



FIG. 8. — Mexican Nut Pine.

and much smaller, those at the base remaining closed and are much reflexed. The seed is nearly cylindric or slightly triangular, about 8 mm. long, compressed at the tapering apex, full and rounded at the base, dark brown in front, nearly black on the back; endosperm sweetish; wing light brown, very narrow, remaining attached to the cone-scales when the seed falls; cotyledons 9 to 15.

The wood is soft, close-grained, and yellow; its specific gravity is about 0.65.

Its seeds are used by the inhabitants of northern Mexico as food, either raw or roasted, the demand being sufficient to make their collection of commercial importance.

8. PARRY'S NUT PINE — *Pinus quadrifolia* Parlatores

This, the rarest of our nut pines, enters our area in southern California, from Lower California, where, in the mountains, it is very abundant. Its maximum height is 12 meters, with a trunk diameter of 4.5 dm. It is also known as Parry's piñon, Nut pine, Parry's pine, and Mexican piñon.

The branches are stout and spreading, forming a dense, regular cone, the lower branches frequently touching the ground; very old trees are more rounded and often irregular. The bark is about 16 mm. thick, shallowly fissured into flat ridges with few close scales or none on the dark reddish brown surface. The twigs are stout, short and softly hairy, soon becoming light reddish brown. The leaves are in fascicles of 4, sometimes 3 to 5, the sheaths soon falling away; they are pale glaucous green, stout, 3.5 to 4.5 cm. long, often 3 mm. wide, the dorsal faces usually the broadest, the tips thickened and short-pointed, entire-margined, marked on the lower surface by 4 to 10 conspicuous rows of stomata and contain 2 large dorsal resin-ducts and a single fibrovascular bundle; they are somewhat scattered on the twigs and persist more or less irregularly for three or four years. The staminate flowers are in spike-like clusters near the ends of the twigs; they are oval, about 5 mm. long; the involucre consists of four conspicuous, irregularly fringed bracts. The pistillate flowers are nearly terminal, usually solitary or few-clustered, almost sessile, subglobose, about 5 mm. long, their scales broadly ovate, rounded and tipped with a short, broad point. The cones, when mature, are subglobose, 4 to 6 cm. long, brown and shining; the apex of the concave scales is thickened, rounded, keeled and provided with a ridged knob which is flattened or sunken in the middle and without any spine or bristle. The unexposed portion of the scales is red and dull; only a few of the central scales bear seeds, the others are sterile and smaller, those at the base remaining closed and much reflexed, forming a rather flat base to the cone. The seed is ovoid, 1.5 cm. long, narrowed and compressed at the apex, full and rounded

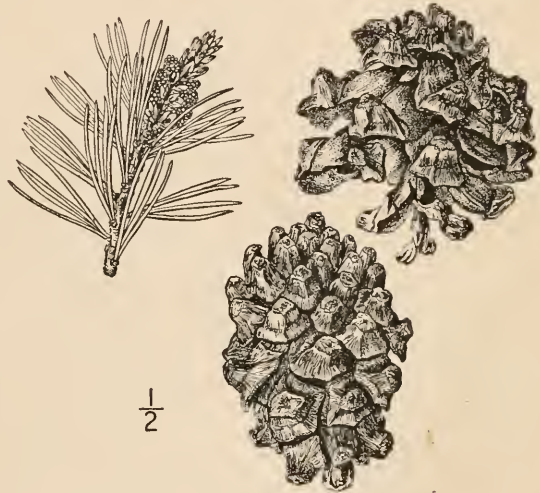


FIG. 9. — Parry's Nut Pine.

at the base, dark reddish brown and slightly mottled; endosperm sweetish and resinous; wing thin, narrow, and pale brown, adhering to the cone-scale when the seed falls out; cotyledons about 8.

The wood is soft, close-grained, yellow or pale brown; its specific gravity is about 0.57.

The seed, like that of other nut pines, is of considerable value as food to the Indians and Mexicans. This tree is sometimes planted for ornament in California.

9. ONE-LEAVED NUT PINE — *Pinus monophylla* Torrey and Fremont

An inhabitant of dry, gravelly soils in the mountains of Utah, Nevada, Arizona, southern California and adjacent Lower California, at elevations of 1500 to 2300 meters, seldom attaining its maximum height of 15 meters, with a trunk diameter of 3 dm., its usual height being only about 7 m.

The trunk is very short, often divided near the ground into several strong spread-



FIG. 10. — One-leaved Nut Pine.

ing branches; these are short and stout, forming a compact conic head, very old trees often having pendulous branches and are more round topped or irregular. The bark is about 18 mm. thick, deeply and irregularly fissured into narrow flattish confluent ridges with close dark reddish brown scales. The twigs are stout, light orange, finally becoming dark brown.

The branch-buds are

ovoid, 6 mm. long, blunt, their scales light brown. The leaves are solitary and round, rarely 2 or 3 in a sheathless fascicle, triangular, pale green and glaucous, round and stout, about 4 cm. long, recurved at the apex, spinescent with a long hard tip, marked with 18 to 20 rows of stomata and containing 2 or 3 resin-ducts and one fibrovascular bundle, they are rather scattered along the twigs and persist for four to six years. The flowers appear in May, the staminate densely clustered near the apex of the twigs, oval or oblong, about 6 mm. long; anthers dark red. The pistillate flowers are lateral, oval, about 6 mm. long, short, stout-stalked, their scales thick, rounded, and tipped with a small point. The cones mature the second autumn, when they are broadly oval, 4 to 6.5 cm. long and almost as thick, light reddish brown and shining; the scales are concave, thick

and four-angled, gradually narrowed into a knob which is flat or sunken at the apex and without either spine or bristle. Like the other nut pines the middle scales only bear seeds; these are oblong, 15 mm. long, rather sharp-pointed, full and rounded at the base, yellowish on the slightly flattened upper side, dark reddish brown on the rounded lower side; endosperm resinous and oily; wing narrow, adhering to the cone-scales when the seed falls; cotyledons 7 to 10.

The wood is soft, brittle and weak, close-grained, yellow to light brown; its specific gravity is about 0.56. It is largely used for fuel and to supply charcoal to the smelters of the region. The seed is used as food by the Indians who gather the cones and expel the seeds from them by heat; they are used fresh or roasted and stored for future use, and are also made into meal.

It is also called Single-leaf pine, Piñon nut pine, Nevada nut pine, Gray pine, and Fremont's nut pine.

10. ROCKY MOUNTAIN NUT PINE — *Pinus edulis* Engelm.

This is also called Piñon, Nut pine, Piñon pine, and New Mexican pinyon, and, like the other nut pines is a small tree of the drier mountain regions, at altitudes of 1800 to 2400 meters, forming forests with Juniper and one or more other pines in southwestern Wyoming, Colorado, eastern Utah, western Texas to Arizona, and adjacent Mexico. Its maximum height is 12 meters, with a trunk diameter of 7.5 dm., but it is usually much smaller.

The trunk is short, often divided very nearly to the ground. The branches are horizontal at first, the tree becoming round topped. The bark is 12 to 18 mm. thick,



FIG. 11. — Rocky Mountain Nut Pine.

irregularly fissured into connected ridges covered by close light brown or reddish yellow scales. The twigs are stout and covered by the closely imbricated scales of the branch-buds, which gradually disappear, the twigs becoming light gray or reddish brown. The leaves are in sheathless fascicles of 2 or 3, triangular or nearly round, dark green, stout, 1.8 to 4 cm. long, entire, marked with 5 to 15 rows of stomata, and contain 2 resin-ducts and a single fibrovascular bundle, the apex

sharp, calloused-tipped; the leaves are rather thinly scattered along the twigs and persist for four to five or even nine years. The staminate flowers are oval, 6 mm. long, the anthers dark red; pistillate flowers are about the same length and oval, the scales somewhat thickened and rounded at the apex, sometimes with a minute tip. The cones, reaching maturity by the second autumn, are nearly globose, about 4 cm. long, very flat at the base, light brown and shining. The scales are comparatively few; the exposed portion is very thick, transversely ridged and narrowed into a four-sided knob with a large concave apex without any spine or bristle. The middle scales only are fertile and much the largest, the others remain closed; they are dull light red on the unexposed portions. The seed is ovoid, 12 mm. long, nearly cylindric and rounded at the base, yellowish above, dark reddish brown below; the wing is about 3 mm. wide, light reddish brown and adheres to the cone-scales when the seed falls; endosperm sweet and resinous; cotyledons 7 to 10.

The wood is soft, weak and brittle, close-grained and pale brown; its specific gravity is about 0.64. It is quite durable and is useful for fencing, fuel, and charcoal, and is sometimes sawed into boards. The seeds are very important as food for the Indians and Mexicans, reaching some commercial importance. The tree is doubtfully distinct as a species from *Pinus monophylla*.

11. CHIHUAHUA PINE — *Pinus chihuahuana* Engelm.

This pine barely enters our area in southern New Mexico and Arizona, being common southward in Mexico. It occurs at an altitude of 1800 to 2250 meters, where it forms the lower fringe of the pine forests. Its maximum height, in our area, is 15 meters, with a trunk diameter of 6 dm. It is characteristic by its sparse foliage and is also called Yellow pine and Chihuahuana top-cone pine.

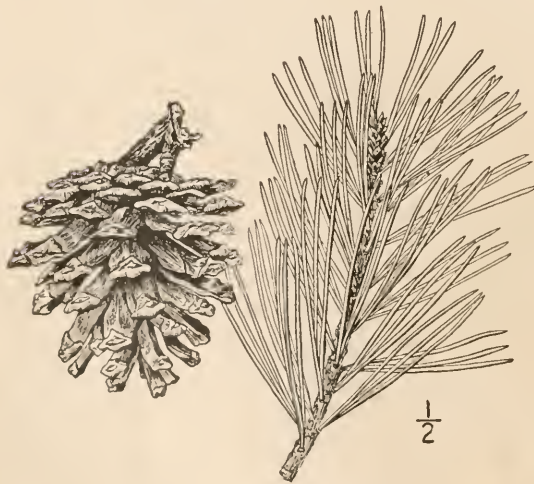


FIG. 12. — Chihuahua Pine.

The branches are somewhat ascending, forming a narrow, round-topped conic tree. The bark sometimes becomes 4 cm. thick, is deeply fissured into broad flat ridges of a dark reddish to nearly black color and covered by close thin scales. The branch-buds are ovoid, sharp-pointed, sometimes 16 mm. long, their scales light brown and fringed. The

leaves are in fascicles of 3, their loose brown sheaths soon falling away; they are pale, glaucous, green, slender, 6 to 10 cm. long, the apex sharp, little calloused;

they are sharply small-toothed, marked by 3 to 6 rows of conspicuous stomata on each face, and contain resin passages in the pulpy tissue and 2 fibrovascular bundles; they are thinly distributed along the twigs and persist for about four years. The flowers appear in July; the staminate in crowded clusters, are oval, about 6 mm. long, with yellow anthers. The pistillate flowers are nearly terminal, stout-stalked, oval, about 8 mm. long, their scales yellowish and long-pointed. The cones, which do not ripen until the end of the third autumn, are broadly ovoid, 4 to 6 cm. long, sharp-pointed, horizontal or somewhat ascending, short-stalked, brown and shining, their scales thin and flat, about 8 mm. wide, very little thickened or keeled, and terminated by an oblong, paler knob, surmounted by a small, often deciduous spine; the lower scales are sterile and remain closed, the unexposed portion being purple; seeds oval, rounded at apex, pointed at the base, about 4 mm. long, dark brown, the wing thin, light brown, about 8 mm. long.

The wood is soft, durable, brittle, close-grained and orange colored; its specific gravity is about 0.54.

12. FOXTAIL PINE — *Pinus Balfouriana* A. Murray

A tree of rocky slopes and ridges of the Mt. Shasta region of northern California to the southern Sierra Nevada, occurring at altitudes of from 1500 to about 3400 meters, where it is often reduced to a shrub. Its maximum height is 30 meters, with a trunk diameter of 1.6 meters.

The branches are short, stout, and outspreading in regular whorls, forming a narrow compact cone; on very old trees the branches frequently develop into irregular, often picturesque heads. The bark is about 18 mm. thick, deeply fissured into broad, connected, flat ridges, which are broken crosswise into thick, nearly square plates with a closely scaly, dark red-brown surface; young stems have a thinner, smoother, whitish bark. The leaves are in sheathless fascicles of 5, stout, stiff, recurved, 2 to 4

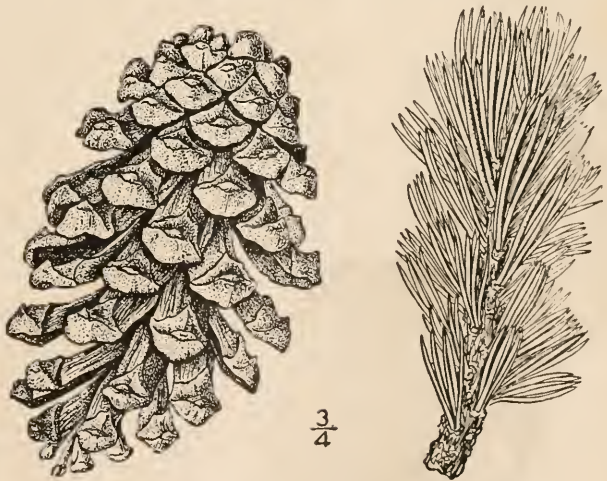


FIG. 13. — Foxtail Pine.

cm. long, dark green and shining above, pale beneath, entire on the margin, the apex tipped by a rigid, sharp point; they are marked by 2 rows of stomata on each ventral surface and contain 2 resin-ducts and a single fibrovascular bundle; they are crowded and pressed close to the twigs, which they cover thickly

for 4 to 6 dm. and persist for a number of years. The staminate flowers are in crowded, spike-like clusters, 12 mm. long; anthers reddish or orange. Pistillate flowers nearly terminal, oblong-oval, about 12 mm. long, their scales dark purple, ovate and sharp-pointed. The cones mature by the second autumn and are pendulous, nearly cylindric, 7 to 12 cm. long, about 4 cm. in diameter and dark purple; the scales are elongated and narrow, slightly concave, much thickened, rounded, transversely ridged, and terminated by an oblong, dark, concave knob, appendaged by a small deciduous spine. The seed is ovoid, full and rounded at the apex, tapering to the flattened base, about 8 mm. long, marked with dark purple; its wing narrowed upwards, somewhat oblique, 4 to 6 mm. wide; cotyledons about 5.

The wood is soft, weak and brittle, close-grained and satiny; its specific gravity is about 0.54. The tree is reported to grow also in southern Oregon.

13. HICKORY PINE — *Pinus aristata* Engelmann

This rather small tree of the mountains of Colorado to Nevada, Arizona and southeastern California seldom forms forests alone, but is interspersed often with the Rocky Mountain white pine, and with Engelmann's spruce, at altitudes of 2,400 to 3,600 meters. Its maximum height is 15 meters, with a trunk diameter of 9 dm. At the higher altitudes it is often shrubby and much contorted. It is also called Foxtail pine and Bristle cone pine.

The branches are stout, whorled, and very regular, forming a rather stiff cone-like tree; in old age it becomes more or less contorted by the irregular development of some of its branches. The bark is 12 to 16 mm. thick, irregularly fissured into confluent, broad, flat ridges, their surface broken into small, close scales of a red-

brown color; on young stems it is thinner, smooth, almost white, and filled with resin blisters which become enclosed in the thicker, older bark. The twigs are stout, orange-yellow and smooth, becoming dark brown or nearly black and roughened by the persistent remnants of the bud-scales. The branch-buds are broadly ovoid, sharp-pointed, 8 mm. long, or the lateral ones smaller, their scales pointed. The leaves are in fascicles of 5, their sheaths soon disappearing; they are dark green and shining, stout or slender and recurved, 2.5 to 4 cm. long,



FIG. 14. — Hickory Pine.

stiff, calloused-tipped, their lower faces marked with narrow rows of pale stomata,

and contain 1 or 2 resin-ducts near the middle of the upper face and 1 fibrovascular bundle; they are numerous and crowded towards the ends of the otherwise naked twigs and persist for ten to twelve years or longer. The flowers appear in June, the staminate in short, crowded clusters, oval, 12 mm. long, with dark orange-red anthers. The pistillate flowers are scaly-stalked, nearly terminal, solitary or in pairs, oblong-oval, 8 mm. long, their scales broadly ovate, dark purple and with long, slender tips. The cones are horizontal or somewhat pendent, ovoid, 6 to 10 cm. long, 4 cm. thick, dark purplish brown, nearly sessile, opening and dropping their seed in September and October; their scales are thin, their tips somewhat 4-sided, but slightly thickened and ridged, the central elevated knob terminated by a slender upcurved prickle often 18 mm. long, light reddish brown and very brittle; the unexposed portion is dull red. The seed is nearly oval, 6 mm. long, flattened, light brown and mottled with black; wing light brown, oblong, oblique, about 8 mm. long and varying considerably in width; cotyledons 6 or 7.

The wood is soft, weak, close-grained, and reddish; its specific gravity is about 0.56. It is sometimes used for mine timbers and for fuel.

14. TORREY'S PINE — *Pinus Torreyana* Parry

This is the most local and probably the rarest of the pines of our region, being confined to an area of a very few square miles in San Diego county, California, and to a small grove on Santa Rosa Island. It attains a height of 18 meters, with a trunk diameter of 7.5 dm. It is also called Soledad pine, Del Mar pine, and Lone pine.

The trunk is short with stout spreading and ascending branches forming a narrow round top; in very exposed positions near the ocean it is often contorted and sometimes almost prostrate. The bark is about 2.5 cm. thick, irregularly and deeply fissured into broad, flat ridges, covered by large, close, thin, light reddish brown scales. The twigs are stout, often 2.5 cm. in diameter, light green, becoming light purple, with a bloom, and covered with large brown-fringed scales finally

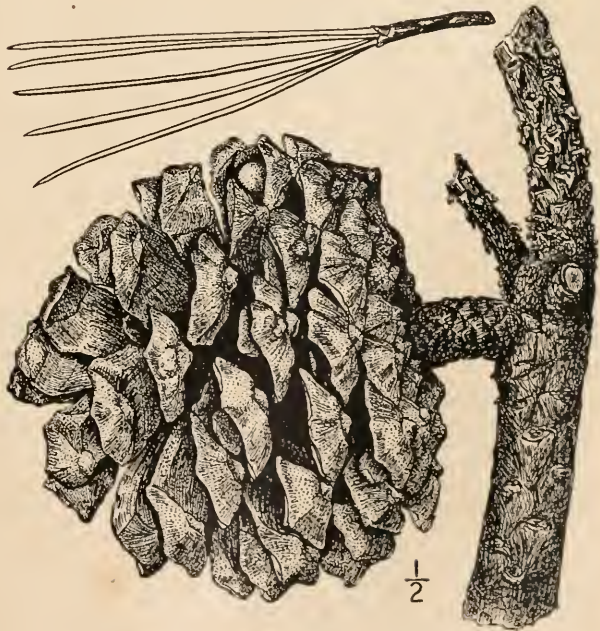


FIG. 15. — Torrey's Pine.

becoming almost black. The branch-buds are cylindric, abruptly taper-pointed, about 2.5 cm. long, or the lateral less than half this size. The leaves are in fascicles of 5, the large persistent sheath 2 to 4 cm. long; they are dark green, slender, 1.5 to 3 dm. long, sharp, thick-tipped, and minutely toothed near the apex, marked on all faces with many rows of stomata and containing 3 resin passages and 2 fibrovascular bundles. They grow in large tufts at the ends of the twigs and persist for several years. The flowers appear from January to March, the staminate in short crowded head-like clusters, cylindric, 2.5 to 4 cm. long, about 8 mm. thick, their anthers yellow; the pistillate flowers are nearly terminal, in pairs, stout-stalked, oblong-oval, 18 mm. long, about 12 mm. thick; scales broadly oval, gradually narrowed into a stout point. The young cones are ovoid, 6 to 7.5 cm. long, brown, with thick red-brown recurved scales, maturing the third autumn, when they are stout-stalked, spreading, broadly ovoid, 1 to 1.5 dm. long, dark brown, and soon discharge some of their seeds, but retaining many until they drop off the tree, a year later; the scales are thick, about 3 cm. wide, prominently 4-angled, and thickened into a central knob which is terminated by a stout angled straight or recurved spine. The seeds are oval, 18 to 25 mm. long, somewhat angular, dull brown, with lighter markings on the upper side; endosperm sweet and oily; the wing has a thickened rim almost encircling the seed, is dark brown, very broad at apex and extends about 10 mm. beyond the seed, from which it separates as readily as it does from the cone-scale; cotyledons 13 or 14.

The wood is soft, weak, and brittle, close-grained and light red; its specific gravity is about 0.49. It is used for fuel; the seeds are also gathered and eaten by Indians, like those of the nut pines.

15. ARIZONA YELLOW PINE—*Pinus arizonica* Engelmänn

A tree of the higher mountain slopes of southern Arizona, and abundant in the mountains of northern Mexico; its maximum height is 30 meters, with a trunk diameter of 1.2 meters. Also called Arizona pine.

The trunk is tall and thick. The branches are stout and spreading, often irregular, forming a narrow conic or irregular round-topped head. The bark is up to 5 cm. thick and fissured into large irregular plates with close light reddish brown scales; on younger stems it is much thinner. The twigs are stout, dark yellowish brown at first, often becoming lighter colored for a time but finally dark grayish brown and roughened by the persistent bases of the bud-scales. The branch-buds are about 10 mm. long, ovoid, sharp-pointed, and closely covered by dark brown, fringed scales. The leaves are in fascicles of 5 or sometimes 3, dark green, slender, stiff, 12 to 18 cm. long, with short sharp, thick tips and small teeth at least toward the apex, and contain 2 fibrovascular bundles; they are densely tufted near the end of the twigs and persist for about three years. The flowers appear in spring, the staminate in clusters near the tips of the twigs, oval, 18 to 25 mm. long, their anthers dark purple. The pistillate flowers are

nearly terminal, usually in pairs, short-stalked, broadly oblong, about 8 mm. long, their scales dark purple, long-pointed, reflexed. The cones are horizontal, oval, 5 to 6 cm. long, bright red-brown and shining; scales somewhat concave, the apex transversely ridged and much thickened into a stout knob, armed by a short curved prickle, dull and red-brown on the upper and dark purple or brown on the under side of the unexposed parts; seed about 3 mm. long, rounded below, slightly flattened toward the apex; wing many times longer than the seed, broadest near the middle, oblique, 4 to 6 mm. wide, thin, light brown.

The wood is soft, weak, somewhat brittle and close-grained, light red or yellowish with very resinous bands and passages; its specific gravity is about 0.50. It is occasionally sawed into lumber, especially in Mexico.

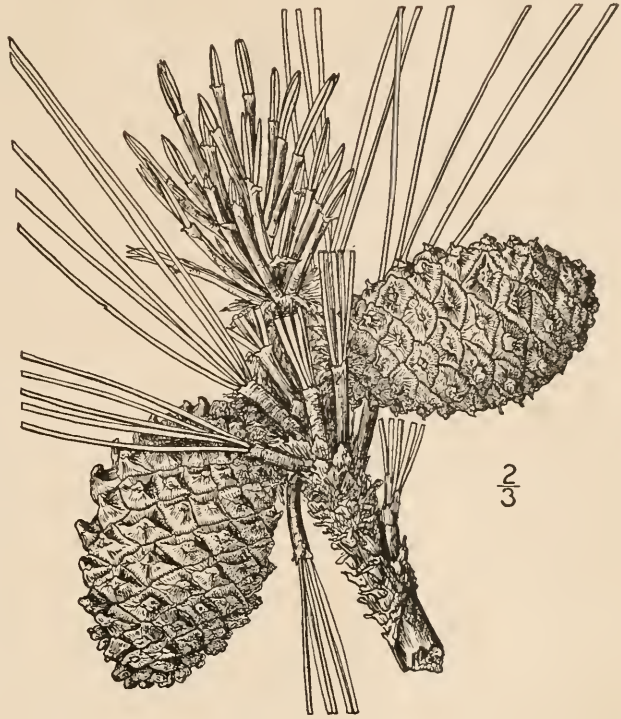


FIG. 16. — Arizona Yellow Pine.

16. RED PINE — *Pinus resinosa* Solander

Of the American pines this is the closest related to the common European or Scotch pine, *Pinus sylvestris* L., so often seen in cultivation in the eastern United States. It is a northern tree, occurring from Nova Scotia to Manitoba southward to the mountains of northern Pennsylvania and central Minnesota, reaching a maximum height of 45 meters, with a trunk diameter of 1.5 m.

The trunk is tall and straight, its branches stout, spreading, more or less pendulous, forming a broad, irregular cone; when very old the lower branches have disappeared and some of the upper ones have enlarged, forming an irregular round open head. The bark is often 3 cm. thick, slightly and shallowly fissured into broad, flat ridges covered with loose, light reddish scales. The twigs are stout, smooth, except for the persistent bases of the bud-scales, purplish brown, finally light reddish brown; the winter branch-buds are ovoid, sharp-pointed, about 18 mm. long, their scales loose, thin, pale brown, dry and fringed on the margin. The leaves are in sheathed fascicles of 2, dark green and shining,

slender and flexible, 12.5 to 15 cm. long, minutely toothed, sharp, hard-tipped, marked on the ventral faces by faint bands of small stomata and containing many small resin-ducts beneath the epidermis and 2 fibrovascular bundles; they persist

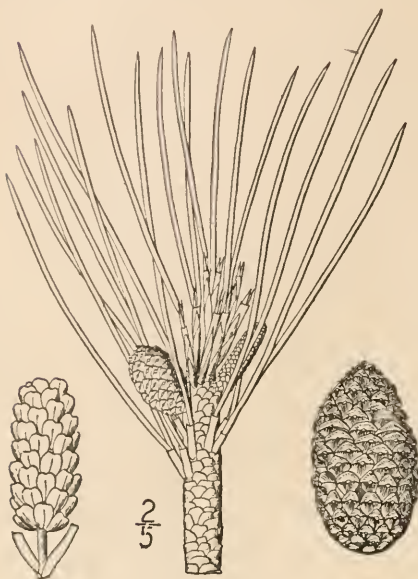


FIG. 17. — Red Pine.

for three to five years. The staminate flowers appear in May, in dense spike-like oblong clusters, 12 to 18 mm. long, the anthers dark purple; the pistillate flowers are terminal, 2 or 3 together, stout-stalked, subglobose, 6 mm. long, their scales scarlet, broadly ovate, the apex reflexed. The cones are horizontal, 5 to 7 cm. long, nearly sessile, light brown and shining, soon shedding their seeds, but the cones persist until the following spring or summer; the unexposed portion of the scales is dull purple; the ends are transversely ridged, slightly thickened, terminated by a spineless knob. The seed is oval, compressed, 3 mm. long, dark brown and mottled; the wing thin, bright brown, about 18 mm. long, broadest near the base and oblique; cotyledons 6 to 8.

The wood is hard, rather close-grained, pale red with dark resin bands and passages; its specific gravity is about 0.48. It is largely used for heavy construction, masts, and piles. The bark is rich in tannin and is sometimes used for tanning. It is a handsome tree in cultivation, being hardy and of very rapid growth, and is also known as Norway pine and Hard pine.

17. BULL PINE — *Pinus ponderosa* Lawson

A tree of the western mountains from Montana and British Columbia to California, at and above an altitude of 600 meters, reaching a maximum height of 70 meters, with a trunk diameter of 2.4 meters.

The trunk is straight and stout, its branches short and thick, much forked and often pendulous, usually ascending at the tips, forming a regular narrow conic tree; in poor soil the branches are stouter, forming a round-topped head. The bark is 5 to 10 cm. thick, deeply furrowed and broken into large broad plates, light reddish brown; on younger stems the ridges are more rounded and covered by close, nearly black scales. The twigs are stout, orange-colored, becoming darker to almost black, and roughened by the thick, persistent bases of the brown bud-scales. The young growth is pungent and peculiarly aromatic. The terminal buds are ovoid, 12 to 18 mm. long, sharp-pointed, almost twice the size of the lateral ones. The leaves are in 2's or 3's in sheathed fascicles, 1.3 to 4 dm. long, small-toothed toward the sharp, stiff apex, dark yellowish green, stomatiferous on all

3 faces, containing 2 to 5 resin-ducts and 2 fibrovascular bundles. They form large tufts at the ends of the otherwise naked twigs and persist for about three years. The staminate flowers are short, crowded, cylindric and usually curved, from 4 to 5 cm. long, their anthers yellow. The pistillate flowers are almost terminal, nearly globose, 8 mm. long, dark reddish, their scales oval and gradually narrowed to slender elongated tips; the conspicuous bracts are orbicular and fringed. The cones are fully grown by midsummer of the second season, when they are horizontal or slightly inclined, short-stalked or nearly sessile, oval, 7.5 to 15 cm. long, often in clusters of 3 to 5, usually falling off early, and in doing so break away from their base, leaving a few of the lower scales attached to the short persistent peduncle. The scales are rather thin and narrow, concave, usually rounded and transversely keeled, and terminated by a raised knob and a straight or recurved slender spine; the exposed portion is light reddish brown and shining, otherwise they are dull reddish brown above, purplish beneath; seed ovoid, 6 mm. long, compressed, sharp-pointed, rounded at the base, dark purplish and mottled; wing narrow, four times longer than the body and 6 mm. wide; cotyledons 6 to 9.

The wood is hard, strong, but brittle, close-grained, light reddish and very resinous in conspicuous bands; its specific gravity is about 0.48. It is not durable in contact with the soil, but is largely used for construction work, fencing, railroad ties, fuel, and lumber. The fiber extracted from the leaves of the variety *Benthamiana* of southern Oregon is used for medicated pillows and rugs; a volatile oil is also distilled from the leaves and used medicinally. The soft sapwood was used by the Indians for food in times of scarcity.

It is also called Yellow pine, Big pine, Longleaf pine, Red pine, Pitch pine, Heavy pine and Heavy wooded pine.

This species varies greatly and many varieties of it have been described. The two following are the most distinct and may perhaps be deserving of specific rank:

Black Pine, *Pinus jeffreyi* A. Murray, also known as Jeffrey's pine, Truckee pine, and Sapwood pine, occurs on dry volcanic mountains from southern Oregon

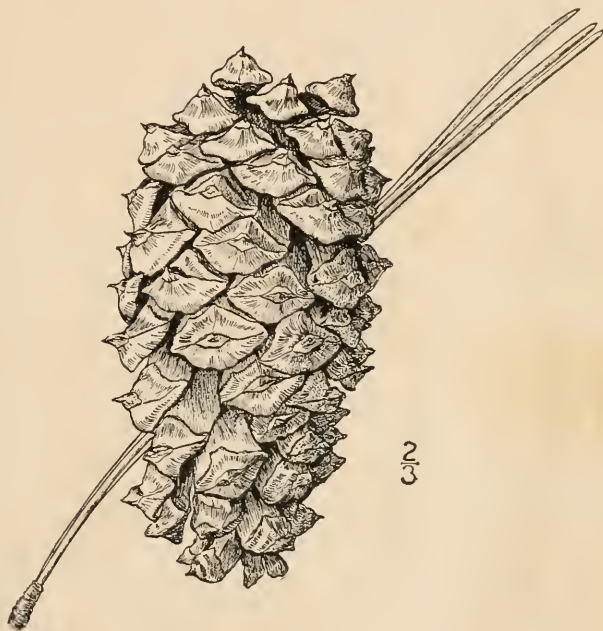


FIG. 18. — Bull Pine.

through California to Lower California, often forming pure forests and reaching a maximum height of 70 meters, with a trunk diameter of 1.8 m.; southward it is often reduced to a straggling shrub. The leaves are 10 to 22 cm. long, stiffer and more elastic than those of the Bull pine, very pungently aromatic and persist for six to nine years. The cones are short-stalked, usually purplish, 12.5 to 30 cm. long, their scales terminated by a thick knob and a hooked prickly; seeds about 12 mm. long, their wings long and wide; cotyledons 7 to 11. The wood is coarser and more resinous, light yellow, its specific gravity is about 0.52; it is made into lumber, and used for the manufacture of pitch. This tree, unlike its near relatives, is said to do well in cultivation.

Arizona Broadleaf pine, *Pinus Mayriana* Sudworth, *Pinus latifolia* Sargent, also called Mayr pine, occurs in the mountains of southern Arizona, and apparently in New Mexico, becoming 18 meters tall, with stout, usually crooked branches and dark brown deeply furrowed bark. The leaves are longer and broader than those of the Bull pine and not so densely tufted, usually in sheathed clusters of 3, about 35 cm. long and 2 mm. wide. The cones are more oblique, their scales terminated by a slender nipple-like knob and a slender prickly. The wood is soft and brittle, light reddish to brown, less resinous, with a specific gravity of about 0.50.

18. ROCK PINE — *Pinus scopulorum* (Engelmann) Lemmon

Pinus ponderosa scopulorum Engelmann

A tree of the Rocky Mountains, from the Black hills of South Dakota to Nebraska through Wyoming and Colorado, southeastern Utah to western Texas and Arizona, reaching a height of 37.5 meters, with a trunk diameter of 1.2 m., but usually about two thirds these dimensions or less.

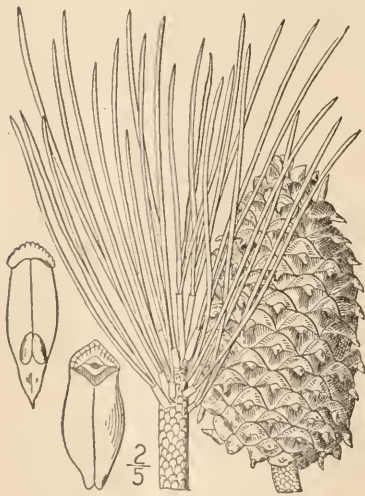


FIG. 19. — Rock Pine.

The branches are stout, forming an open conic head, becoming in old age round-topped and often picturesque. The bark is deeply furrowed and nearly black or covered by brown-red scaly plates. The twigs are rather stout, dull brown to black, and much roughened by the bases of the bud-scales. The leaves are in sheathed fascicles of 2 or 3, light green and rather stout, 7.5 to 15 cm. long, stiff-pointed, and persist for several years. The staminate flowers are clustered, cylindric, about 2.5 cm. long. The cones are subterminal, nearly sessile, ovoid-conic when closed, ovoid when open, 5 to

10 cm. long, their scales wide and thin, with keeled tips, terminated by a low knob and slender recurved prickly, light yellowish brown on the exposed surface, reddish brown on the unexposed portion. The cones in falling leave

their basal scales attached to the persistent peduncle. Seed obovate, rounded, about 6 mm. long, light brown and mottled; wing about 15 mm. long, broadest at the apex, oblique and easily detached from the seed.

The wood is hard, brittle, coarse-grained and resinous, light brown; its specific gravity is about 0.46.

It is also called Long-leaved pine, Bull pine, Yellow pine, Foothills pine, and Rocky Mountain yellow pine, and is perhaps better regarded as an eastern form of the preceding species.

19. SHORE PINE — *Pinus contorta* Loudon

The Shore pine occurs chiefly along the coast from Alaska to Mendocino county, California, at the north in *Sphagnum* bogs, southward on sand dunes and in other barren places. Its maximum height is 24 meters, with a trunk diameter of 1.5 m.; usually, however, it is scarcely 7.5 m. tall with a trunk diameter of 4.5 dm., and is often reduced to a shrub bearing cones when only a few dm. high.

The trunk is short, its branches rather stout, forming a compact round-topped head, sometimes grotesquely irregular. The bark is 2 cm. thick, irregularly and deeply fissured in both directions into small, oblong plates, thickly covered with close dark red-dish brown scales of a purplish or sometimes orange tinge; on younger stems it is thinner, smoother, and of various shades of red or brown. The twigs are stout, smooth and yellowish, gradually darkening through red-brown to nearly black, and roughened by the persistent bases of the bud-scales; branch-buds ovoid, sharp-pointed, often 12 mm. long and dark brown. The leaves are in loose-sheathed fascicles of 2, dark green, 2.5 to 5 cm. long, slender, minutely sharp-toothed and with short thick tips; they are marked by 6 to 10 rows of deep stomata on each face and contain 2 resin-ducts

and 2 fibrovascular bundles; they persist for about six years. The staminate flowers are short, crowded spike-like, oblong or broadly cylindric, 12 mm. long; their anthers are orange. The pistillate flowers are in terminal or subterminal clusters or pairs, erect to nearly horizontal, on stout, scaly stalks, subcylindric, about 5 mm. long, their scales long-tipped, orange-red. The young cones are erect or spreading, oval, 12 to 18 mm. long and light red-brown; at maturity, the next autumn, they are solitary or in clusters, oval or subcylindric, 2 to 5 cm. long, very oblique at the base, light yellowish brown and shining, usually opening and



FIG. 20. — Shore Pine.

dropping their seed promptly, but sometimes remain closed on the branches for many years, the seeds retaining their vitality; the scales are thin, concave, the rounded apex ridged and slightly thickened into a narrow, oblong dark knob, terminated by a long, slender, more or less recurved and often deciduous spine, bright reddish purple on the unexposed surfaces; seed about 2 mm. long, dark reddish brown with black markings; the wing thin, about 10 mm. long, widest at or below the middle, oblique and tapering toward the apex and base, pale brown; cotyledons 4 or 5.

The wood is hard, strong, but brittle, coarse-grained, light reddish brown with conspicuous resin bands and small resin passages; its specific gravity is about 0.58. In Alaska the inner bark is baked and used for food by the Indians.

It is variously known as Twisted pine, Scrub pine, Bolander's pine, Henderson's pine, and Tamarack.

20. LODGE POLE PINE — *Pinus Murrayana* Balfour

A tree of the mountains, from the Yukon River south and eastward to Assiniboia, Montana, and southward to southern California and southern Colorado. It is the principal tree in the Yellowstone Park, forming the forests of the higher

mountains, where it makes the timber line at an altitude of about 3000 meters. Its maximum height is 50 meters, with a trunk diameter of 1.8 m.; usually it is of about half these dimensions or less.

The trunk is tall and slender, the branches are short, forming a tall, very slender conic tree having the aspect of a Larch rather than a Pine. The bark is 6 to 12 mm. thick, one of the thinnest of all our pines, quite smooth and orange-colored. The twigs are rather stout, light brown, becoming dark gray and very rough. The leaves are in sheathed fascicles of 2, stout and stiff, 5 to 7.3 cm. long and 2 mm. wide, finely toothed near the stiff, sharp-pointed apex, yellowish green,

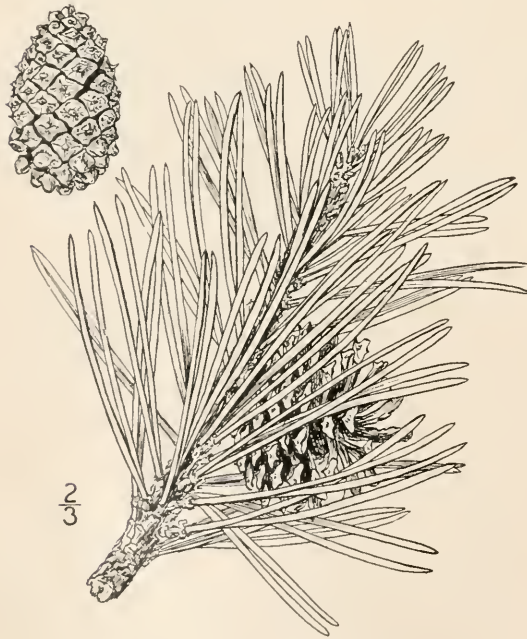


FIG. 21. — Lodge Pole Pine.

marked with many stomata on all surfaces and persist for several years. The staminate flowers are dense, spike-like, oblong or narrowly cylindric, about 10 mm. long with orange-colored anthers. The pistillate flowers are usually in nearly

terminal pairs, long-stalked, globose, about 10 mm. long, their orange-red scales long-tipped. The cones usually mature and shed their seed in the autumn of the second season; they are oblong when closed, nearly globose when open, 4 to 5 cm. long, their thick scales terminated by an angular pyramidal knob with a deciduous spine, bright yellowish brown on the exposed portion, purplish and brown on the unexposed portions; seed obovate, about 2 mm. long, nearly black and roughened; wing narrow, oblique, very thin, straw-colored, 1 to 1.5 cm. long.

The wood is soft, weak, close and straight-grained, light yellow or nearly white, with very little resin, so as to resemble White pine or Spruce. It is easily worked but not durable; its specific gravity is about 0.41. It is sawed into lumber to a small extent and used in construction, for railroad ties and for fuel. The inner bark and soft sap-wood is used by the Indians when other food is scarce; they also use the inner bark in their basketry.

It is also called Prickly pine, White pine, Black pine, Spruce pine, Murray pine, and Tamarack pine, and is closely related to *Pinus contorta*, some authors regarding them as only forms of one species.

21. LONGLEAF PINE — *Pinus palustris* Miller

This very valuable tree occurs in the sandy belt bordering our southeastern coast, from southeastern Virginia to Florida and along the Gulf coast to Louisiana and Texas, extending northward in Alabama to the foothills of the mountains where it locally occurs at an altitude of 600 meters; west of the Mississippi River it reaches the northern boundary of Louisiana but avoids the river valleys. Its maximum height is 40 meters, with a trunk diameter of 1.5 m.

The trunk is tall, straight, and somewhat tapering; its few branches, confined to the top, are more or less twisted, forming an open irregular head, about one third the height of the tree. The bark is about 2 cm. thick, more or less fissured and broken into irregular scaly plates, their surface covered with thin close papery scales of a light yellowish brown color; that of the branches is thin and scaly. The twigs are stout, dark brown and roughened by the persistent bases of the bud-scales. The branch-buds are narrowly ovoid, about 3 cm. long and sharp-pointed; their numerous scales are grayish white, their margins cut into numerous long weak whitish threads. The leaves are in broad-sheathed fascicles of 3, bright green, soft and flexible, 2 to 4 dm. long, about 1.5 mm. thick, minutely toothed; they are sharp, stiff-tipped, and marked by many rows of deep stomata



FIG. 22. — Longleaf Pine.

on all 3 faces, and contain from 3 to 5 resin-ducts in the inner pulp and 2 fibro-vascular bundles. They are crowded in dense tufts at the very tips of the twigs, more or less drooping, and persist for two years. The flowers appear in March, the staminate short, dense, narrowly cylindric, incurved, 5 to 6 cm. long; anthers dark reddish purple. The pistillate flowers are nearly terminal, usually in pairs or often several in a cluster, short scaly-stalked, oval, about 8 mm. long, the scales dark purple, broadly ovate, tapering upward into slender tips, their bracts wider than long. The cones, which mature the second autumn, are nearly sessile, horizontal or pendent, cylindric or oblong when closed, oblong when open, 1.5 to 2.5 dm. long, often slightly curved, dull brown, shedding their seed on opening, and persist for another season; their scales are thin and flat, blunt at the apex, conspicuously ridged, slightly thickened and terminated by a flattened knob, and armed by a small reflexed spine; the unexposed portion is dull purple below and reddish brown and shining above; seeds somewhat angled, about 12 mm. long, pale brown and prominently ridged; wing thin and brittle, 4.5 to 5 cm. long, about 1 cm. wide, reddish brown and shining; cotyledons 7 to 10.

The wood is very hard, strong and tough, coarse-grained, light red or orange colored, very resinous; its specific gravity is about 0.70. It is quite durable and largely used for masts and other purposes requiring large strong timbers, also for railroad ties, fencing, flooring, and interior finishing, fuel and charcoal.

The oleoresin is of very great importance, and is the basis of an extensive industry, most of the resin and oil of turpentine being products of this species; it is also the principal source of the pine tar used in America.

It has received many names, as: Southern pine, Southern yellow pine, Southern hard pine, Southern heart pine, Southern pitch pine, Yellow pine, Turpentine pine, Rosemary pine, Heart pine, Pitch pine, Broom pine, Hard pine, Georgia pine, Fat pine, Long-leaved yellow pine, Longleaf pitch pine, Longstraw pine, Georgia yellow pine, Georgia heart pine, Georgia longleaf pine, Georgia pitch pine, Florida pine, Florida yellow pine, Florida longleaf pine, Texas yellow pine, Texas longleaf pine.

22. PITCH PINE — *Pinus rigida* Miller

A widely distributed tree of eastern North America, growing in the poorest soils from New Brunswick to Ontario and Ohio and southward to northern Georgia and Alabama. Its maximum height is 25 meters, with a trunk diameter of 9 dm., but it often bears fruit when only several meters high.

The trunk is stout, the branches stiff, horizontal, and often in remote whorls forming an open narrow cone. Very old trees have the branches more or less contorted, often pendulous at the ends, forming an irregular round-topped, often picturesque head. The bark is about 3 cm. thick, irregularly deeply broken into broad flat confluent ridges which are covered with irregular, rather loose, red-brown or purplish red scales. The twigs are smooth, light green soon becoming

yellow, finally dark grayish brown, and roughened by the persistent bases of the bud-scales; branch-buds ovoid or ovoid-oblong, narrowed and sharp at the tip, the scales loose, dark brown, and shining. Leaves in sheathed fascicles of 3, bright green, rather stout and stiff, 6 to 12 cm. long, closely and sharply toothed and tapering to a thick tip, the stomata sunken, in many rows on all 3 faces, containing 3 to 7 resin-ducts and 2 fibrovascular bundles; they are in rather spreading tufts and persist for two or three years. The flowers appear in the spring; the staminate, in short crowded clusters, are cylindric, 1.5 to 2.5 cm. long, anthers yellow. The pistillate flowers are lateral, more or less clustered, short-stalked, subglobose, about 4 mm. long, the scales light green with a reddish tint at the contracted, slightly spreading tip. The cones, which reach maturity by the second autumn, are nearly sessile, ovoid to globose, 4 to 7 cm. long, light brown, opening and shedding their seed during the autumn and winter, usually persisting on the branches for ten or more years. The scales are thin and flat, prominently ridged with a dark knob and armed with a stiff recurved



FIG. 23. — Pitch Pine.

prickle on the exposed end, reddish on the unexposed surfaces; seed somewhat angled, oblong, 4 to 6 mm. long; wing about 8 mm. long; cotyledons 4 to 6.

The wood is soft, weak, coarse-grained and resinous, bright brown or reddish with broad resin bands; its specific gravity is about 0.51. It is quite durable; sometimes sawn into lumber and also used for railroad ties, construction timbers, fuel, and charcoal. It was formerly one of the chief sources of turpentine, but has been superseded by the more productive Long-leaf pine. Its adaptability to poor soils and its rapid growth thereon make this a most valuable tree for the reforestation of the poor, wornout or neglected lands of mountain sides.

Shoots growing from cut stumps sometimes bear many primary leaves with the secondary fascicled ones in their axils.

It is known by many names, such as Hard pine, Long-leaved pine, Longschat pine, Yellow pine, Black pine, Black Norway pine, Rigid pine, Sap pine, and Torch pine.

23. POND PINE — *Pinus serotina* Michaux

A tree of the sandy swamps of the coastal plain from Virginia to Florida, attaining a maximum height of 25 meters, with a trunk diameter of 9 dm.

The trunk is short, its branches stout, often more or less pendulous at the ends, usually forming a round-topped tree. The bark is up to 18 mm. thick, irregularly and shallowly fissured into small plates with thin, close, dark reddish brown scales. The twigs are slender, glabrous, dark green, soon becoming dull

dark yellow to nearly black, and roughened with the persistent bases of the bud-scales; branch-buds broadly ovoid, 8 to 12 mm. long, tapering upward to a sharp tip. The leaves are in sheathed fascicles of 3, seldom in 4's, glaucous green, 7.5 to 12.5 cm. long, closely and minutely toothed, the tip stiff; they have many rows

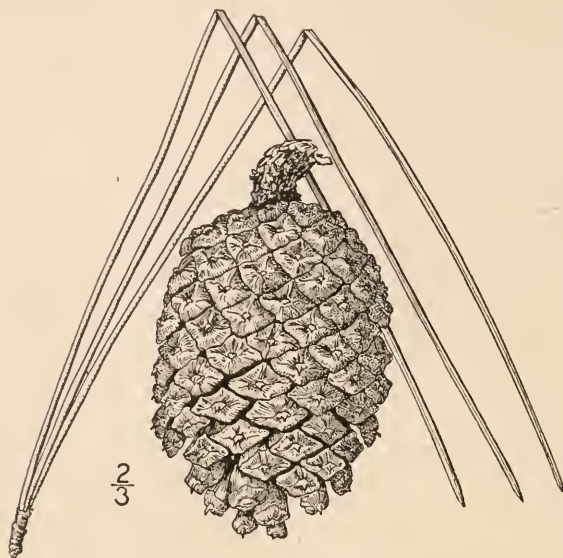


FIG. 24. — Pond Pine.

of deep stomata on all 3 faces and contain 5 to 7 unequal resin-ducts, some of which are in the inner tissue, and 2 fibrovascular bundles. They persist for three or four years. The staminate flowers are in crowded clusters, oblong-cylindric, 1.5 to 2 cm. long, their anthers dark reddish-yellow. The pistillate flowers are lateral, in pairs or clusters, short-stalked, ovoid-oblong, their scales gradually tapering to a slender tip. The cones are horizontal or slightly drooping, ovoid or globular-ovoid, 4 to 6 cm. long, light yellowish brown, and remain closed for several years

before dropping the seed, after which they still persist for two or three years more; the scales are rounded at the apex and thickened by a dark oblong knob, terminated by a slender, incurved, usually deciduous prickle; seed about 3 mm. long, nearly black, often ridged and usually roughened; wing thin and very delicate, striped and shining, narrowly oblong, about 18 mm. long, 3 to 5 mm. wide; cotyledons 4 to 6.

The wood is soft, brittle, coarse-grained, dark orange-colored, very resinous; its specific gravity is about 0.79; it is sometimes used for masts and for construction timbers, and occasionally sawed into lumber. The tree is locally tapped for turpentine.

It is also known as Loblolly pine, Marsh pine, Bull pine, Black pine, Bastard pine, Meadow pine, and Spruce pine.

24. SHORT-LEAVED PINE — *Pinus echinata* Miller

Pinus mitis Michaux

This tree grows in poor sandy or clayey soil from southern New York and New Jersey to Florida, westward to Illinois, Kansas, and northeastern Texas. It is most abundant and of greatest development in the southwestern part of its range, where it reaches a maximum height of 40 meters, with a trunk diameter of 1.5 m.

The trunk is tall and somewhat tapering, the branches rather slender, slightly pendulous, forming a rounded or conic top. The bark is often 2.5 cm. thick, coarsely fissured into large irregular plates with close reddish scales. The twigs are stout, very brittle, pale green to violet with a bluish bloom, becoming dark purplish red, finally darker and scaly. The branch-buds are ovoid, gradually narrowed to a blunt tip, the scales lanceolate, pointed, and dark brown. The leaves are in sheathed clusters of 2, and often in 3's, dark bluish green, soft and flexible, 7 to 13 cm. long, about 1.5 mm. thick, minutely and closely toothed, sharp-pointed, with many rows of stomata on all faces, containing 2 to 6 resin-ducts and 1 fibro-vascular bundle; they are in crowded clusters and persist for two or three or even five years. The pale grayish green, lanceolate, and long-pointed primary leaves are abundantly produced on sprouts from stumps or injured portions of the tree. The flowers appear in April or May, the staminate in short crowded clusters, oblong-cylindric, about 18 mm. long, with light purplish anthers. The pistillate flowers are in pairs or clusters of 3 or 4, lateral, but often near the ends of the branches, erect and stoutly stalked, oblong or globose, about 8 mm. long, their scales ovate, sharp-tipped, pink or pale red. The cones, ripening in the autumn of the second season, are short-stalked and pendulous, usually in clusters, conic when closed, ovoid when open, 5 to 6.5 cm. long, dull brown, opening soon after reaching maturity and persisting for several years. The scales are rather thin and concave, rounded at the apex, transversely ridged, slightly thickened and provided with a small oblong knob, armed with a short, straight or slightly recurved early deciduous bristle, their unexposed surfaces reddish and shining on the upper side, dark purple and dull beneath; seed oblong-triangular, little flattened, about 5 mm. long, somewhat ridged, pale brown and somewhat roughened; its wing is thin and fragile, light reddish and shining, about 2 cm. long, oblique and tapering each way from the middle.



FIG. 25. — Short-leaved Pine.

deciduous

The wood is hard, strong, coarse-grained, dark yellow or light brown and resinous; its specific gravity is about 0.61. It furnishes the most desirable of the yellow pine lumber of commerce, being less resinous and more easily worked than that of other species, and is used for general construction and carpentry and in cabinet work.

This tree also is tapped for turpentine, especially in North Carolina. It is of great value as a reforester, spreading rapidly over neglected lands, soon transforming them into valuable forests. It is occasionally seen in cultivation and is known under many common names, most of which have also been applied to other species of pine, as Yellow pine, Spruce pine, Bull pine, Shortschat pine, Pitch pine,

Poor pine, Shortleaf yellow pine, Virginia yellow pine, North Carolina pine, North Carolina yellow pine, Carolina pine, Slash pine, and Old Field pine.

25. LOBLOLLY PINE — *Pinus Tæda* Linnæus

This rather rapid growing tree occurs from southern New Jersey to Florida, westward to Louisiana and Texas, also up the Mississippi valley to Indian Territory and Arkansas, reaching a maximum height of about 50 meters, with a trunk diameter of 1.5 m.

The trunk is straight and tapering; the branches are stout, horizontally spreading, on the upper ascending, usually forming a round-headed tree. The bark is up to 2.5 cm. thick, shallowly fissured into irregular, broad, low ridges, covered with large thin close scales of a reddish brown color. The twigs are slender, smooth, yellowish brown, glaucous and roughened by the persistent bases of the bud-scales. The branch-buds are sharp or taper-pointed, their scales bright brown, darker tipped and fringed. The leaves are in sheathed fascicles of 3, pale green or slightly bluish, slender, stiff, sometimes twisted, 1.5 to 2.5 dm. long, closely small-toothed, sharply stiff-pointed, marked by several lines of large stomata on each of the 3 faces and containing 3 to 5 resin-ducts and 2 fibrovascular bundles; they persist for about five years. The flowers appear in March; the staminate are cylindric in crowded clusters, curved, 1.5 to 3 cm. long; their anthers are yellow. The pistillate flowers are lateral, solitary, in pairs or clusters of 3, oblong, 8 to 12 mm. long, their scales yellow, ovate-lanceolate with long slender, sometimes incurved, tips. The cones are nearly sessile, narrowly conic when closed, cylindric or conic-cylindric when open, 10 to 13 cm. long, light reddish brown, opening slowly and discharging the seed during the autumn and winter, but persisting on the branches for another season; their scales are rather thin, slightly concave, irregularly rounded, ridged and provided with a knob which is surmounted by the stout, straight, or somewhat curved spine, reddish or purplish on the unexposed surfaces. The seed is rhomboidal



FIG. 26. — Loblolly Pine.

or nearly triangular, 5 to 7 mm. long, dark brown and roughened, its wing broad, thin and fragile, pale brown and shining, broadest toward the apex, or just above the seed, 2 cm. long; cotyledons 6 or 7.

The wood is soft, rather weak and brittle, coarse-grained with conspicuous resin bands and light brown; its specific gravity is about 0.64. It is extensively made into lumber, also selected for ship timbers and masts; it constitutes much of the yellow pine lumber of our northern markets. The tree is sometimes tapped

for turpentine, but although very resinous its sap does not flow freely, as it thickens and becomes hard too rapidly.

This tree is known under many common names, as Old field pine, Torch pine, Shortleaf pine, Rosemary pine, Slash pine, Black slash pine, Longschat pine, Longshucks pine, Frankincense short leaf pine, Bull pine, Virginia pine, Sap pine, Meadow pine, Cornstalk pine, Black pine, Foxtail pine, Indian pine, Spruce pine, Bastard pine, Yellow pine, Swamp pine, and Long straw pine.

26. SLASH PINE — *Pinus caribæa* Morelet

Pinus heterophylla (Elliott) Sudworth. *Pinus Elliottii* Engelm. *Pinus bahamensis* Grisebach

This tree occurs in the coastal region from North Carolina to Florida and westward to Louisiana; also in the western and northern Bahamas, and in western Cuba, reaching a maximum height of 35 meters, with a trunk diameter of 1.5 m.



FIG. 27. — Slash Pine, southern Florida.

The trunk is straight and somewhat tapering, usually free of branches for over half its height. The branches are long, horizontal, forming a round-topped or irregular head. The bark is usually about 3.5 cm. thick, shallowly fissured

into broad, flat, irregular plates covered with thin, reddish brown scales; the inner layers of the bark are yellowish brown. The twigs are stout, smooth, dark yellow at first, becoming much darker and roughened by the persistent bases of the bud-scales. Branch-buds are cylindric, gradually narrowed to the apex, about 4 cm. long, the lateral ones much smaller, the scales shining brown and fringed

with long white hairs. The leaves are in sheathed clusters of 2 or 3, the 2-leaved clusters often occurring on young plants; they are dark green and shining, stout, 17 to 30 cm. long, closely small-toothed, tipped with a short thickened point, marked by many lines of stomata on all faces, and contain 4 to 6 resin passages and 2 fibrovascular bundles; they are crowded at the

ends of the twigs and persist for about two years.

The flowers appear in January and February before the new leaves appear, the staminate ones cylindric, 1.5 to 2.5 cm. long, usually incurved, with dark purple anthers.

The pistillate flowers are nearly terminal, short-stalked, oval, 12 mm.

long, the scales broadly

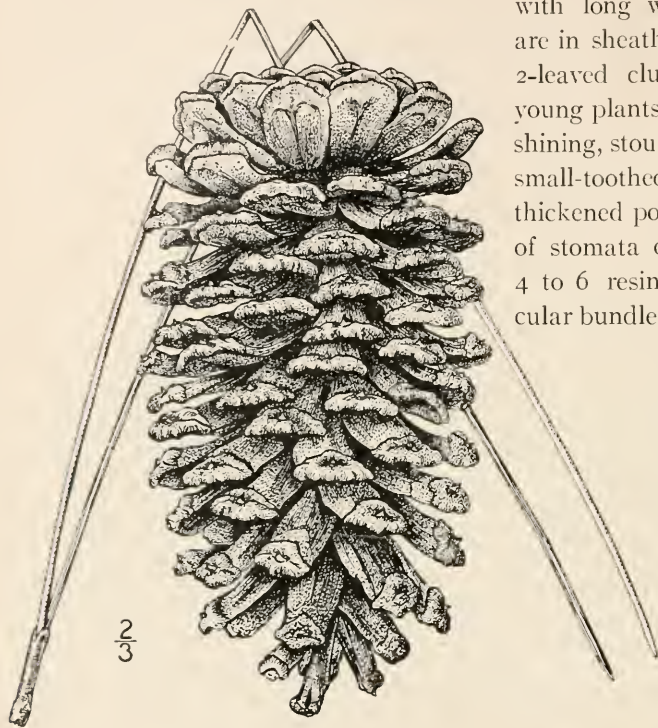


FIG. 28. — Slash Pine.

ovate and pink, the bracts large. The cones are narrowly conic when closed, cylindric or conic-cylindric when open, 9 to 14 cm. long, dark brown and shining, discharging the seed in October and persist until the following summer; their scales are thin, nearly flat, rounded at the apex, ridged and thickened into a low knob which is surmounted by a small spine, the latter incurved on basal scales, recurved on scales toward the apex of the cone; the unexposed portion of the scales is dark, dull purple beneath, dull red above. The seed is almost triangular, rounded on the sides, 5 to 7 mm. long, dark gray, mottled and roughened; the wing thin, fragile, dark brown and striped, 2 to 2.5 cm. long, with a blunt apex; cotyledons 6 to 9.

The wood is very hard, strong and tough, coarse-grained and very resinous, dark orange-colored; its specific gravity is about 0.75. It is quite durable and scarcely inferior to that of the Longleaf pine and is used indiscriminately as such.

This tree is also tapped for turpentine and is said to yield a softer resin containing more spirits than the Longleaf pine. It is a rapid grower; the seed ger-

minating very readily into vigorous young plants which soon take entire possession of the ground even when other species of pine are present. It is also considered the handsomest of the southeastern pines.

It is also called Swamp pine, Bastard pine, Meadow pine, Pitch pine, She pitch pine, She pine, and Spruce pine.

27. DIGGER PINE — *Pinus Sabiniana* Douglas

This tree, also called Gray pine, Bull pine, Grayleaf pine, and Sabine's pine, occurs locally in the foothill region of western California, reaching an altitude of 1200 meters. It never forms forests, but grows singly or in small groups, attaining a maximum height of 24 meters and a trunk diameter of 1.2 m.

The trunk is short, usually divided at 5 or 6 meters above the ground into several stout spreading branches, which are again divided into very crooked limbs, pendulous below, ascending above, forming an open, round-headed tree, unlike any other pine. The bark is about 5 cm. thick, deeply and irregularly fissured into rounded confluent ridges, covered with small close scales of a dark red-brown to nearly black color. The twigs are rather stout, smooth, glaucous bluish, becoming brown and finally nearly black, and roughened by the persistent bases of the scales. The branch-buds are oblong-ovoid, sharply pointed, about 2 cm. long, their shining brown scales slightly fringed. The leaves are in sheathed fascicles of 3, pale bluish green, slender, not stiff, 2 to 3 dm. long, 1.5 mm. thick, sharply and rather coarsely toothed toward the sharp, slender apex, entire toward the base, the stomata in several rows on each face; they contain 2 or 3 resin-ducts in the pulp and 2 fibrovascular bundles; they are rather pendent, very sparse, and persist for three or four years. The staminate flowers are oblong, about 2 cm. long, their anthers yellow. The pistillate flowers are erect, oblong-obovoid, about 12 mm. long, dark purple and glaucous, their scales ovate and terminated by slender, incurved tips. Cones are oblong-ovoid, flat or

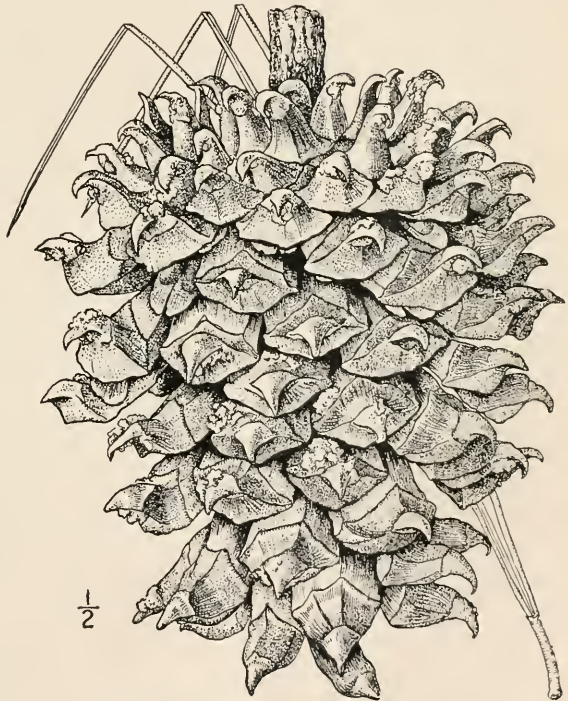


FIG. 29. — Digger Pine.



FIG. 30. — Coulter's Pine.

rounded at the base, pointed at the apex, 1.5 to 2.5 dm. long, 1 to 1.5 dm. thick, of a light reddish brown color, losing their seed gradually and persisting on the branches for several years; their scales are woody, slightly concave, 2.5 cm. wide, rounded, transversely ridged, and contracted into a prominent, flattish knob, reflexed below the middle and erect above the middle of the cone and armed with a thick, sharp stout spine which is upright or curved outward. The seed is oblong, 18 mm. long, rounded at the base and apex, slightly flattened toward the apex, dark brown to almost black with resinous and oily endosperm; the wing encircling the seed is much thickened on its inner margin, its apex broad and oblique, about one half as long as the seed; it soon breaks away from both seed and scale; cotyledons about 15.

The wood is soft, weak and brittle, close-grained, very resinous, light brown or reddish; its specific gravity is about 0.48. It is not durable and very little used.

The seeds were an important food for the Indians, who used them as they did those of nut pines. A volatile oil known as abietene is obtained by distillation of the resinous sap.

28. COULTER'S PINE — *Pinus Coulteri* Lambert

This pine grows over much the same area as the Digger pine, but at higher altitudes, occurring at from 900 to 1800 meters. It forms small groves or occurs singly, on the dry gravelly soils of the coast range, from Mt. Diablo, California, southward, reaching a maximum height of 21 meters, with a trunk diameter of 1.2 m. It is also known as Pitch pine, Big cone pine, Large cone pine, and Nut pine.

The branches are stout and irregular, usually drooping below, short and ascending toward the top, forming an open, irregular, often very picturesque head. The bark is up to 5 cm. thick, deeply fissured into broad, rounded confluent ridges, covered by close thin scales of a dark brown to nearly black color; that of the large branches smoother. The twigs are very stout, often 2.5 cm. thick, dark yellow brown at first, gradually becoming darker and finally nearly black, and roughened by the persistent bases of the bud-scales. Branch-buds ovoid, sharp, often abruptly pointed, sometimes 4 cm. long, scales dark-tipped, dry and fringed on the margin. Leaves in sheathed clusters of 3, dark bluish green, 1.5 to 3.5 dm. long, often 3 mm. thick, stout and stiff, small-toothed above the middle, usually entire below, long callous-tipped, marked by many rows of stomata on the faces and containing 4 to 10 various sized resin-ducts and 2 fibrovascular bundles. They persist for three or four years. The staminate flowers are in crowded clusters, cylindric, 4.5 cm. long, 8 mm. thick, somewhat curved, their anthers yellow. Pistillate flowers stalked, ascending, oblong-oval, about 18 mm. long; their scales ovate, dark red-brown, glaucous and contracted into long incurved tips. The young cones are spreading or pendent, oblong, 5 cm. long and light yellow by the first autumn, maturing the following autumn when they have become short-stalked, pendent, ovoid, 2.5 to 3.5 dm. long, 1 to 1.25 dm. thick, light

yellowish brown, partially opening and slowly shedding the seed during the fall and winter and often remaining on the branches for another season. The scales are thick and wide, rounded at the apex, thickened into an elongated and transversely flattened knob, terminated by a strong, flattened, strongly upcurved spine 1.2 to 4 cm. long; the scales are dull dark purple on the unexposed faces. The seed is oval, compressed, 12 mm. long, dark brown and ridged, encircled by a wing with thickened inner margin, broadest near the oblique apex, nearly twice longer than the seed, brown, shining, and striped by dark lines and separating from both seed and cone-scales; cotyledons about 12.

The wood is soft, weak, brittle, coarse-grained, light red, with wide conspicuous resin bands and very large resin-ducts; its specific gravity is about 0.41. It is sometimes used as fuel.

It is successfully grown in western Europe and is admired for its general beauty and large cones.

29. KNOB CONE PINE — *Pinus attenuata* Lemmon (*tuberculata*)

A tree of dry mountain sides at altitudes of from 300 to 1500 meters from Oregon to southern California, remarkable for its growth in poor dry soils and attaining a maximum height of 30 meters, with a trunk diameter of 7.5 dm.; often, however, it is but 6 meters tall with a trunk diameter of 3 dm. and often fruiting when less than 2 meters high.

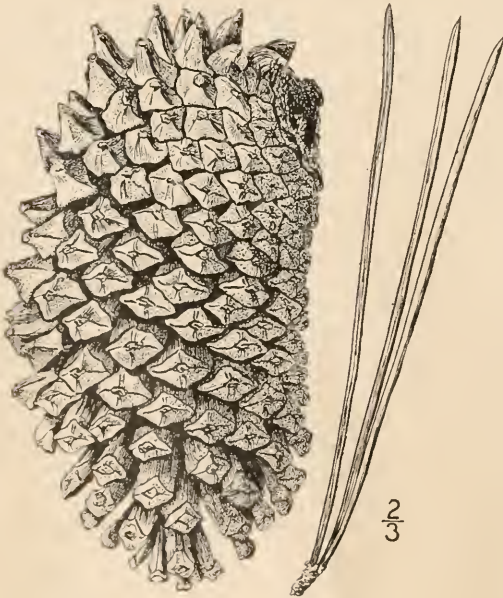


FIG. 31. — Knob Cone Pine.

The trunk is often forked above the middle into 2 trunk-like branches; the branches are relatively slender, in regular distant whorls, horizontal, curving upward at the tips and forming a broad-based compact cone, becoming a narrow and round-headed tree when old. The bark is up to 12 mm. thick, somewhat shallowly fissured into irregular, loose, dark, sometimes purplish plates, but smooth, close, and pale brown, on younger stems.

The twigs are slender, dark yellow-brown and smooth, becoming dark with age and roughened by the persistent bases of the bud-scales. Branch-buds are oblong-ovoid, sharp-pointed, 12 to 16 mm. long, with brown-fringed scales. Leaves in sheathed clusters of 3, pale green or bluish green, 7.5 to 13 cm. long, slender, remotely toothed and sharp callous-tipped,

with several rows of stomata on all 3 faces, containing 2 to 5 small resin passages and 2 fibrovascular bundles; they are thinly distributed over the twigs and persist for at least two years. The staminate flowers are cylindric in spike-like clusters, 18 mm. long, their anthers brownish orange colored. The pistillate flowers are in clusters of 2 to 4, oblong, 12 mm. in diameter, their scales ovate, broad, with slender upcurved tips. The cones are short-stalked, strongly reflexed, elongated-conic, very oblique at the base, 7.5 to 13 cm. long, light brown, remaining closed and persist for many years before opening, often becoming imbedded in the bark and usually all shedding their seed at one time, at the death of the tree. The cone-scales are narrow, flat, enlarged into prominent, transversely ridged knobs, armed with upcurved spines; those toward the apex and on the lower side of the cone are thinner and only slightly thickened, transversely ridged with a small dark-colored knob and a small recurved spine or none. Seeds oblong-oval, compressed, rather sharp-pointed, 6 mm. long and black, their wing 3 cm. long, oblique, broadest at the middle, gradually tapering toward each end, light brown, shining and longitudinally striped; cotyledons 6 to 8.

The wood is soft, weak and brittle, coarse-grained, and light brown with inconspicuous resin bands, but large conspicuous resin passages; its specific gravity is about 0.35. It is sparingly used for cabinet work and for fuel.

The region in which the trees grow is periodically fire-swept, the trees being killed, and the seeds of a lifetime's production having retained their vitality during their long imprisonment in the cones are liberated and produce a dense growth of vigorous seedlings which soon reclothe the region with a new forest covering.

It is variously known as the Prickly cone pine, Snow line pine, Sandy slope pine, Narrow cone pine, Tuberculated cone pine.

30. MONTEREY PINE — *Pinus radiata* D. Don

Pinus californica Loiseleur

A coastal tree occurring on sand dunes and exposed sea cliffs extending very little away from the sea in the vicinity of Monterey bay and on some of the islands adjacent to the southern California coast. Its maximum height is 30 meters, with a trunk diameter of 1.8 m.

The branches are thick and spreading, forming a somewhat irregular round-topped tree. The bark is up to 5 cm. thick, deeply furrowed into broad flat ridges and broken into close dark reddish brown plates. The twigs are slender, yellow, often glaucous, roughened by the persistent bases of the bud-scales, gradually becoming dark reddish brown. The branch-buds are ovoid, sharp-pointed, sometimes 12 mm. long, the scales bright brown and fringed. The leaves are in brown-sheathed fascicles of 3 or sometimes 2, bright green, slender, 1 to 1.5 dm. long, 1 mm. thick, minutely toothed, short callous-pointed, stomata on all 3 faces, usually containing but 1 resin-duct in the pulp and 2 fibrovascular bundles; they are densely set on the twigs and persist for about three years. The staminate flowers

are in dense spike-like clusters, oblong, 12 mm. long, their anthers yellow. The pistillate flowers are in lateral clusters, short-stalked, their scales ovate, dark purple, narrowed into a slender, incurved tip, the bracts broad and conspicuous.

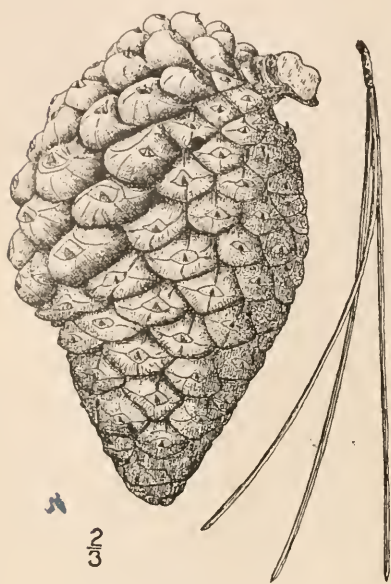


FIG. 32. — Monterey Pine.

The cones mature in the autumn of the second year, when they are short-stalked, reflexed, oval, 7.5 to 12.5 cm. long, pointed at the apex, very oblique at the base, deep bright brown and shining, usually remaining closed and persistent for many years. The scales are thin, nearly flat, apex much thickened and rounded, slightly ridged and terminated by a dark 4-sided knob, armed with a short thickened incurved or straight spine; they are deep purple on their unexposed surface. The seed is oval, compressed, 6 mm. long, black and roughened; the wing thin, light brown and striped lengthwise, broadest above the middle, oblique, and gradually tapering both ways, 2 cm. long and 8 mm. wide; cotyledons 5 to 7.

The wood is soft, weak and brittle, close-grained, light brown with many distinct resinous bands; its specific gravity is about 0.46.

It is sometimes sawed into lumber but finds its greatest utility as fuel.

This tree is more extensively planted for ornament in the West than any other pine, also successfully used in the southeastern States and Mexico, Australia, and Europe.

It is also called Spreading cone pine, Nearly smooth cone pine, Remarkable cone pine, Small-coned Monterey pine, and Two-leaved Insular pine.

31. SPRUCE PINE — *Pinus glabra* Walter

A tree of our southeastern States, confined to the coastal plain from South Carolina to middle Florida and Louisiana, occurring in river swamps and hummocks, usually rare and local except in northwestern Florida where it is quite common and reaches a maximum height of 40 meters, with a trunk diameter of 1.2 m.

The branches are horizontal, their divisions usually at right angles. The bark is about 1.5 cm. thick, shallowly fissured into irregular confluent ridges with close light reddish scales, or often nearly smooth. The twigs are slender, smooth, somewhat zigzag, light reddish, or purplish brown, soon becoming reddish brown, a little roughened by the bases of the bud-scales; branch-buds ovoid, 6 mm. long, sharp-pointed, their scales brown and margined by whitish matted hairs. The leaves are in short-sheathed fascicles of 2, dark green, slender, 4 to 8 cm. long,

about 1.5 mm. thick, soft and flexible, slightly toothed, taper-pointed by a sharp thickened tip, with 2 or 3 resin-ducts, one of which is frequently found in the inner tissue, and 2 fibrovascular bundles; they are crowded, and persist for two or three years. The staminate flowers are in crowded clusters, cylindric, about 12 mm. long, 3 mm. thick, their anthers yellow. The pistillate flowers are lateral, at some distance away from the end of the twig, slender-stalked, subglobose, 6 mm. long, their scales broad, ovate, their bracts elliptic. The cones, maturing the second autumn, are short-stalked, reflexed, single or in clusters of 2 or 3, conic when closed, ovoid when open, 3.5 to 5 cm. long, red-



FIG. 33. — Spruce Pine.

dish brown and somewhat shining, opening and shedding the seed soon after ripening, and persist on the branches for two or three years; scales thin, slightly concave, rounded, only slightly thickened and scarcely ridged, the dull knob small and terminated by a small usually deciduous prickles; they are dull purple on the unexposed surfaces. The seed is nearly triangular, 4 mm. long, its sides rounded, dark gray and slightly roughened and mottled; the wing is thin and delicate, 1.5 cm. long, 6 mm. wide, dark brown and shining, broadest about the middle; cotyledons 5 or 6.

The wood is soft, weak, and brittle, very close-grained, light brown with few and small resin bands; its specific gravity is about 0.39. It is not durable and but little used, being seldom cut for lumber but to some extent for fuel. The tree is also known as Cedar pine, Poor pine and Walter's pine.

32. GRAY PINE — *Pinus Banksiana* Lambert

Pinus sylvestris divaricata Aiton. *Pinus divaricata* (Aiton) Gordon

A northern tree, ranging from Nova Scotia to the Northwest Territory and south to Maine, northern New York and the southern shores of the great lakes to central Minnesota, reaching in its greatest perfection, west of Lake Winnipeg,

a height of 30 meters, with a trunk diameter of 1 m.; usually, however, it is but 12 to 20 m. tall, and at its northern limit often a mere shrub.

The trunk is straight, the branches long, slender, spreading, forming a symmetrical open tree, or, when crowded, often free of branches for one third its length. The bark is thin, fissured into irregular confluent rounded ridges with thick close scales of a dark brown or reddish color. Twigs rather slender and flexible, yellowish green and smooth, becoming dark purplish brown and roughened by the dark, persistent bases of the bud-scales. The leaves are in sheathed fascicles of 2, dark green, about 3 cm. long, 1.5 mm. thick, stout and stiff, somewhat curved, convex on the back and nearly flat on the inner surface, minutely toothed and abruptly narrowed into a stout tip, marked by many lines of deep stoma-



FIG. 34. — Gray Pine.

mata and containing 1 or 2, sometimes more, resin-ducts in the pulp, and 2 fibrovascular bundles. They are rather loosely scattered along the twigs and persist for two or three years. The staminate flowers are in spike-like clusters, oblong, about 10 mm. long; anthers yellow. The pistillate flowers, usually in pairs or sometimes more in a cluster, are short-stalked, subglobose, their scales oval, narrowed into incurved tips and dark purple. The cones are sessile, upright, oblong-conic, much incurved, seldom recurved, oblique at base, 3 to 5 cm. long, dark yellow brown and shining, remain closed for several years, and open very irregularly and persist for ten to fifteen years. The scales are thin and stiff, rounded, scarcely ridged, and terminated by a dull, slightly raised knob provided with a raised point instead of a spine or prickle; they are dull purple or red on the unexposed portion.

The seed is obliquely triangular, flattened, with rounded sides, about 5 mm. long, roughish and nearly black; the wing is pale and shining, about 10 mm. long and broadest at the middle, oblique at the apex; cotyledons 4 or 5.

The wood is soft, weak, close-grained, usually pale brown or light yellow, with wide and distinct resin bands; its specific gravity is about 0.48. It is used for fuel at the North, but seldom sawed into lumber, and in the Northwest is also used for railroad ties and fencing.

It is also known as Labrador pine, Jack pine, Scrub pine, Black pine, Black Jack pine, Canada horn cone, Check pine, Sir Joseph Bank's pine, and erroneously as Juniper and Cypress.

There is considerable superstition about this tree having evil effects both on the soil and on persons coming in contact with it; the tree grows rapidly and is well adapted to lawn and park planting.

33. SAND PINE — *Pinus clausa* Chapman

A tree of both coasts of Florida and the coast of southern Alabama, usually on sand dunes, and reaching a maximum height of 24 meters, with a trunk diameter of 7.5 dm.

The trunk is often clothed to the ground with spreading slender branches, forming a dense, sometimes flat-topped tree. The bark is about 10 mm. thick, deeply but narrowly fissured into irregular, oblong plates with close light reddish brown scales; on small stems it is thin, smooth, and gray. The twigs are slender, tough and pliable, smooth and yellowish green, becoming reddish brown and finally gray, and roughened by remnants of the bud-scales. The branch-buds are oblong-cylindric, about 6 mm. long, with a rounded apex, the pointed brown scales shining and margined with pale green hairs. The leaves are in sheathed fascicles of 2, deep green, 4 to 9 cm. long, .75 mm. thick, very slender and flexible, minutely toothed, sharply short callous-tipped, marked with 10 to 20 rows of stomata and containing 2 resin-ducts, one of which is in the pulpy part of the leaf, and 2 fibrovascular bundles; they are rather crowded and persist for three or four years. The staminate flowers are in elongated, crowded clusters, cylindric, 10 mm. long; their anthers are yellowish brown. The pistillate flowers are lateral, short-stalked, subglobose or oval, their scales ovate and long-pointed. The cones, maturing the second autumn, are short-stalked, usually clustered around the twig, conic when closed, ovoid when open, 4.5 to 6 cm. long, mostly oblique at the base and dark reddish brown, sometimes opening at maturity, but usually remaining closed for three or four years, becoming light gray; some remain closed and persist, becoming encased by the bark or wood growing around them. Their scales are concave, prominently ridged, and thickened into a central knob which is armed by a short, straight or curved, usually deciduous spine; the seed is nearly triangular, 5 mm. long, flattened, black and slightly roughened; the wing thin and fragile, red-brown and shining, about 1.5 cm. long, widest near the middle.

The wood is soft, weak, and brittle, light brown or yellow, with broad, resin bands and conspicuous resin-ducts; its specific gravity is about 0.56. It is sometimes used in ship-building for masts.

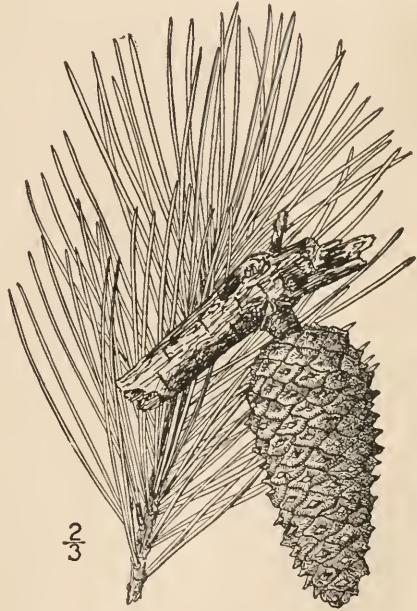


FIG. 35. — Sand Pine.

The tree, on account of its rapid growth, is very valuable in regions of shifting sand, as a binder of the soil.

It is also known as Old field pine, Spruce pine, Scrub pine, and Florida spruce pine.

34. JERSEY PINE — *Pinus virginiana* Miller

Pinus inops Aiton

This tree grows in poor rocky or sandy soil from southern New York to Indiana, southward to Georgia and Alabama, is very abundant in Maryland and Virginia, but reaches its largest size, 36 meters tall, with trunk diameter of 1 m., in southern Indiana. Its usual height is about 12 meters.

The trunk is short, its branches long, spreading or pendulous, in remote whorls forming a broad rather flat-topped conic tree. The bark is up to 12 mm. thick, shallowly fissured into flat plates with thin close dark brown scales on its surface. The slender twigs are tough and pliable, smooth, purple, with a bluish bloom, finally becoming grayish brown, and roughened by the thickened bases of the bud-scales; branch-buds ovoid, 8 to 12 mm. long, sharp-pointed, their scales dark brown with dryish margins. The leaves are in sheathed fascicles of 2, deep green and shining, 4 to 7 cm. long, 1 mm. thick, rather stout, soft, flexible and more or less twisted, finely toothed, sharply thick-tipped, marked by many rows of small stomata, usually containing 2 resin-ducts and 2 fibrovascular bundles; they are very fragrant, rather



FIG. 36. — Jersey Pine.

closely dispersed on the twigs and persist for three or four years. The staminate flowers are crowded, oblong, about 10 mm. long, their anthers yellow-brown. The pistillate flowers are lateral, near the middle of young shoots, are long-stalked, subglobose, their scales ovate, slender-tipped, pale green with a reddish tinge. The cones are sessile, or nearly so, spreading, narrowly conic when closed, ovoid when open, 4 to 7 cm. long, dark red-brown, opening in the autumn of the second season and slowly dropping their seed, often persisting for three or four years. The scales are thin, nearly flat, slightly thickened, conspicuously ridged and raised into a small dark knob, armed with a persistent, slender curved spine; they are dull red on the unexposed surfaces. The seed is obliquely oblong, about 5 mm. long, with rounded sides, slightly ridged and rough, pale brown, the wing 1.5 cm. long, broadest at the middle, dark brown, striped and shining; cotyledons 5.

The wood is soft, weak, and brittle, close-grained, light orange-colored with

many wide resinous bands; its specific gravity is about 0.53. It is quite durable and is used to some extent as lumber, and for pumps and water tubes. It is extensively used for fuel.

It is hardy to a considerable distance northward of its range, and although a rapid grower is not admired as an ornamental, other species being preferred. It is, however, very valuable as a reforester, soon forming a rapid-growing covering for worn-out and neglected lands.

It is also called by many other names, as Scrub pine, Short pine, Short-leaved pine, Cedar pine, River pine, Nigger pine, New Jersey pine, Shortschat pine, and Shortshucks.

35. TABLE MOUNTAIN PINE — *Pinus pungens* Michaux

A tree of the mountains, on dry, gravelly, or rocky slopes from New Jersey and Pennsylvania to North Carolina and northern Georgia; its maximum height is 18 meters with a trunk diameter of 1 m., often much smaller and frequently fruiting when only several meters high. It is also called Southern mountain pine and Prickly pine.

The trunk is short and stout, the horizontal branches short, the lowest pendulous at the tips, the upper ascending, usually forming a broad open tree, often irregular; when crowded the branches are few near the top, and form an irregular narrow round head. The bark is about 2 cm. thick, fissured into irregular plates with a loose, dark reddish brown scaly surface. The twigs are stout, smooth, and light orange at first, becoming darker, somewhat purplish and finally dark brown, and roughened by the dark, persistent bases of the bud-scales. The branch-buds are narrowly elliptic, about 12 mm. long, tapering to a blunt point, the lateral ones much smaller. The leaves are in sheathed fascicles of 2, light bluish green, 4 to 10 cm. long, 1.5 mm. thick, stiff and somewhat twisted, finely toothed, sharp callous-pointed, marked by many rows of stomata, and contain 2 to 5 resin-ducts of various sizes in the pulp and 2 fibrovascular bundles; they are crowded at the ends of the twigs and persist for two or three years. The staminate flowers are in long, loose spike-like clusters, oblong, 1 to 1.5 cm. long, their anthers yellow. The pistillate flowers are lateral, somewhat clustered, stout-stalked, subglobose to ovoid, the scales ovate, narrowed into stiff, long, slender tips, the bracts large, nearly round. The cones are spreading, usually in clusters of 3, sometimes 5 or more, ovoid when closed,



FIG. 37. — Table Mountain Pine.

globose-ovoid when open, 8 to 12 cm. long, oblique, light brown and shining, opening when ripe and gradually dropping the seed or remaining closed for several years, usually persisting on the branches for from fifteen to twenty-five years. The scales are thin and woody, their exposed portion much thickened, conspicuously ridged, thick-knobbed and armed with a stout spine, which is upcurved above and recurved below the middle of the cone; they are dark purplish or reddish on the unexposed surfaces. The seeds are nearly triangular, 6 to 7 mm. long, rounded on the sides, light brown and roughened, their wing thin, fragile, pale and shining, often streaked with red, about 2 cm. long, broadest below the middle, oblique and gradually rounded at the apex.

The wood is soft, weak, and brittle, very coarse-grained, resin bands conspicuous and passages large; its specific gravity is about 0.44. It is extensively used for fuel and also made into charcoal.

36. PRICKLE CONE PINE — *Pinus muricata* D. Don

A tree of coastal California occurring in isolated stations from Mendocino county southward into Lower California, reaching its greatest development of 27 meters tall and a trunk diameter of 9 dm.

nodule-like scales,

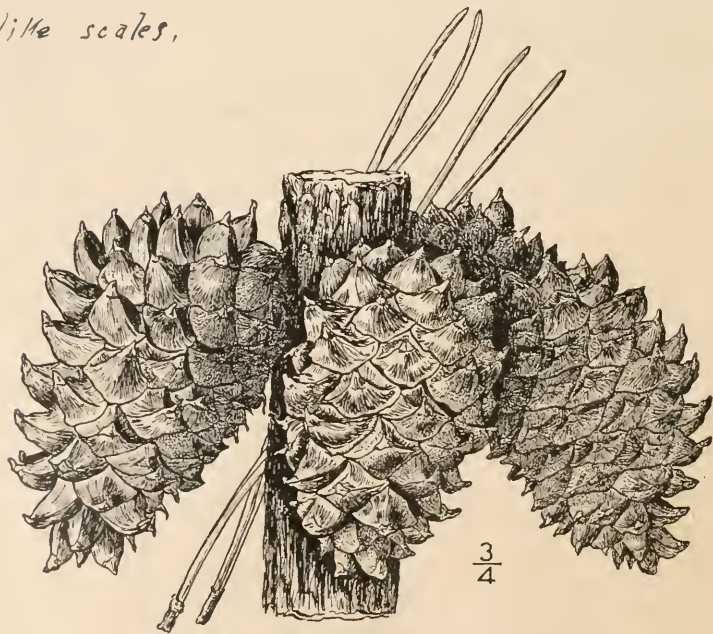


FIG. 38. — Prickle-Cone Pine.

The branches are stout, horizontal, forming a regular conic tree when young; older trees are dense and round-topped. The bark is up to 1.5 dm. thick, deeply furrowed into long elongated, rounded ridges which are roughened by close, dark

purplish or purplish brown scales. The twigs are stout, smooth, dark yellowish green becoming yellow-brown and finally purplish brown, and roughened by the persistent bases of the bud-scales. Branch-buds are ovoid, about 8 mm. long, sharp-pointed, their scales pale reddish brown with a margin of pale matted hairs. The leaves are in sheathed fascicles of 2, 1 to 1.5 dm. long, nearly 2 mm. thick, stiff, minutely toothed, sharply thick-tipped and marked by many rows of stomata; they contain 2 to 9 resin-ducts and 2 fibrovascular bundles. They are in crowded tufts and persist for two or more years. The staminate flowers are in long spike-like clusters intermingled with the large scales of the branch-buds, oval, 6 mm. long, their anthers dark orange-colored. The pistillate flowers are lateral, in whorls, stout-stalked, about 8 mm. long, their scales ovate, narrowed into long, slender, spreading tips, the bracts large and nearly orbicular. Cones are erect at first, maturing the second autumn, when they are sessile and clustered in 3's or 5's, pendulous, ovoid-oblong, 5 to 8.5 cm. long, very oblique, light bright brown and shining, often remaining closed for a number of years before opening and dropping their seed, and usually persisting indefinitely; the scales are much thickened and flattened on the exposed portions; the knob below the apex is flattened and armed with a stout stiff flattened spine. The seed is somewhat triangular, 5 mm. long, roughened and nearly black, the wing about 2 cm. long, broadest near the middle; cotyledons 4 or 5.

The wood is very hard and strong, rather coarse-grained, light brown with little resin. Its specific gravity is about 0.49. It is sparingly sawed into lumber.

It is said to be a very desirable pine for planting in the Pacific States and is known by many names, as: California swamp pine, Prickly cone pine, Obispo pine, Dwarf marine pine, Bishop's pine, and Anthony's pine.

II. THE LARCHES

GENUS **LARIX** ADANSON



THIS genus is composed of about eight species of conic trees, which, like most of the north temperate conifers, are reduced to mere shrubs at high altitudes and latitudes. They are confined to the cooler portions of the northern hemisphere, three species inhabiting North America, two occurring in Europe, and four or five in Asia.

Aside from their use as lumber, they produce no important economic products, except that the oleoresin from the European larch, *Larix Larix* (L.) Karsten, the type of the genus, is used medicinally under the name Venice turpentine.

The trunks are straight, rather slender, and covered by thick, rough, scaly or furrowed bark. The branches are remote and slender, usually horizontal, sometimes ascending; the branchlets are slender, elongated, and usually pendulous; they are roughened by short, scaly, bud-like branches. The buds are small, nearly globose, covered by many broad shining brown scales, some of which

persist for a time, leaving, when falling, a ring-like scar at the base of the newly formed twig. The leaves are deciduous, usually turning yellow before dropping, and are borne on short lateral branchlets, many crowded into sheathless fascicles, narrow, linear, triangular or rarely 4-sided, rounded above, keeled and stomata-bearing beneath, and contain 2 resin-ducts close to the epidermis. The flowers are monœcious, appearing with the leaves. The staminate inflorescence is borne on short leafless lateral branchlets, globose to oblong, sessile or short-stalked, and consists of many spirally arranged short-stalked 2-celled subglobose anthers, opening crosswise or diagonally. The pistillate inflorescence is lateral, on leafy branchlets of a previous season, its base surrounded by the inner scales of the bud, subglobose and nearly sessile, composed of few or many spiral, nearly orbicular thin scales, having two collateral, inverted ovules at the inner base. The bracts are paper-like, long-tipped, longer than the scales, and scarlet. The cones are erect, rather small, subglobose to oblong-cylindric, short-stalked, composed of persistent, thickish, suborbicular to oblong-ovate, concave, woody scales, which are more or less irregularly toothed and often striate lengthwise, gradually becoming smaller and sterile toward each end of the cone; the bracts are longer or shorter than the scales, the lower usually persistent on the stalk of the cone. The two seeds at the base of each fertile scale are nearly triangular, rounded on the sides, crustaceous, light brown, somewhat shining; the endosperm is copious and fleshy, the wing oblong, longer than the seed; cotyledons usually 6.

The name applied to these trees by Adanson is the classical one for the old world Larch. The North American species are:

Eastern tree; cones 1 to 2 cm. long, the scales exceeding the bracts.

1. *L. laricina*.

Western trees; cones 2.5 to 5 cm. long, the scales shorter than the bracts.

Leaves 3-angled; twigs pubescent or at length smooth.

2. *L. occidentalis*.

Leaves 4-angled; twigs woolly.

3. *L. Lyallii*.

1. TAMARACK — *Larix laricina* (Du Roi) Koch

Pinus laricina Du Roi. *Pinus pendula* Aiton. *Larix americana* Michaux

The American Larch, also called Hackmatack, Black larch, and Red larch, occurs from Newfoundland and Labrador to Alaska, northward reduced to the height of 2.5 meters or less, but retaining an arborescent form, and ranges southward to southern New York, Pennsylvania, Wisconsin and Minnesota; it grows mainly in swamps and on banks of lakes and streams, attaining a maximum height of 35 meters with a trunk diameter of one meter.

Its branches are slender and horizontal, forming a slender conic tree. In the open it eventually develops long, irregular upper branches, making a broad irregularly rounded head. The bark is 1.5 to 2 cm. thick, peeling off into thin, closely adhering irregular scales of a red-brown color; the younger bark is thinner, smoother, and bluish gray. The twigs are slender, smooth, frequently covered with a bloom, becoming dark dull brown with age. The winter buds

are globose, dark red, and shining. The leaves are pale green, filiform, triangular, rounded above, keeled below, 1 to 2.5 cm. long, numerous in each cluster, terminating branchlets about 4 mm. long; they fall off in the autumn. The staminate flowers are sessile, subglobose, and light yellow; the pistillate flowers are borne on the lateral branchlets of the previous year, are short-stalked, oblong, and reddish. The cones, which are borne on short, stout branchlets, are ovoid, blunt, 12 to 20 mm. long, light brown, shedding their seed during the autumn and early winter, and fall off the next spring and summer; the scales are nearly orbicular, slightly longer than wide, concave, slightly irregularly toothed or entire; those near the middle of the cone are the largest, those towards each end smaller; the bracts are about half the length of the scales and abruptly tipped; the brown seed is about 3 mm. long, one third the length of its wing.



FIG. 39.—Tamarack.

The wood is hard, strong, compact but coarse-grained, light brown, and durable; its specific gravity is about 0.62. It is largely used in ship-building; also for telegraph poles and railroad ties. The bark and the resinous exudation therefrom are reputed to be of some medicinal value.

As an ornamental tree it is the most desirable of the Larches for planting in the northern States, growing very rapidly and retaining its symmetry of form longer than any other.

The Alaska larch, *Larix alaskensis* W. F. Wight, very recently described, is said to differ from the Tamarack by shorter leaves, relatively longer cone-scales, and bracts not abruptly tipped.

2. WESTERN LARCH — *Larix occidentalis* Nuttall

This, the largest known species of its genus, is also called Red American larch, Great Western larch, and Western tamarack. It occurs only in the valleys of the Columbia River and its tributaries, where it is scattered through the great mixed forests for which this region is famous, growing on mountain sides up to 2100 meters, but reaches its greatest development of 75 meters, with a trunk diameter of 2 meters in the river or creek valleys in northern Montana and Idaho.

The branches are elongated, mainly horizontal, and rather distant, forming an open cone. The lower branches die and fall off before the tree attains a great age, exposing a very high, straight-tapering trunk, naked for three fourths or more of its height, with a short narrow head on which there are so few of the short narrow leaves that it seems remarkable how the tree thrives with so small an amount

of leaf-surface. The branchlets are relatively short. The bark is very thick on old trees, often 12 to 15 cm., fissured into large irregular elongated scaly plates of a dark red-brown color; on young trees it is relatively thinner and scaly. The twigs are stout, with soft pale hairs, orange to brown, becoming smooth and darker brown. The winter buds are globose, 3 to 4 mm. thick, and covered with hairy brown scales. The slender leaves are 3 to 4 cm. long, about 0.5 mm. thick, triangular, convex on the back, keeled below, and stiffly sharp-pointed, rather pale green, turning yellow before falling in the autumn. The staminate flowers are oblong, short-stalked, and pale yellow. The pistillate flowers are oblong, sessile or nearly so, less than 1 cm. long. The short-stalked cones are 3 to 4 cm. long, about 2 cm. thick, oblong-ovoid, reddish brown, composed of thin, loose, widely spreading scales placed nearly at right angles to the axis when mature; they are entire or slightly irregularly toothed on the sometimes slightly reflexed margins, hairy on the lower half of the under side, almost orbicular, 2 cm. in diameter,



FIG. 40. — Western Larch.

and half the length of the bracts; these are oblong, abruptly contracted into the tip, which is about 2.5 cm. long, projecting far beyond the scales. The seed is pale brown, 5 mm. long, scarcely half the length of its pale, thin wing.

The wood is very hard, strong, close-grained, durable, bright dark orange to brown; its specific gravity is about 0.74, the third heaviest wood of our coniferous trees; it takes a fine polish and is largely used in the manufacture of furniture, also extensively for railroad ties and fence posts. A sweetish substance resembling dextrine is exuded when this tree is wounded, and used by the Indians as food.

This, by far the grandest of the Larches, seems not to have been cultivated in Europe. It is said not to thrive in the eastern United States unless grafted upon the roots of some other member of the genus.

3. WOOLLY LARCH — *Larix Lyallii* Parlatores

This tree, also called Lyall's larch, Mountain larch, Larch, and Tamarack, is an alpine species, growing only near the timber-line of mountains between the altitudes of 1350 and 2400 meters, being known from Montana, Oregon and Washington to Alberta and southern British Columbia; its maximum height is 25 meters, with a trunk diameter of 1.2 meters.

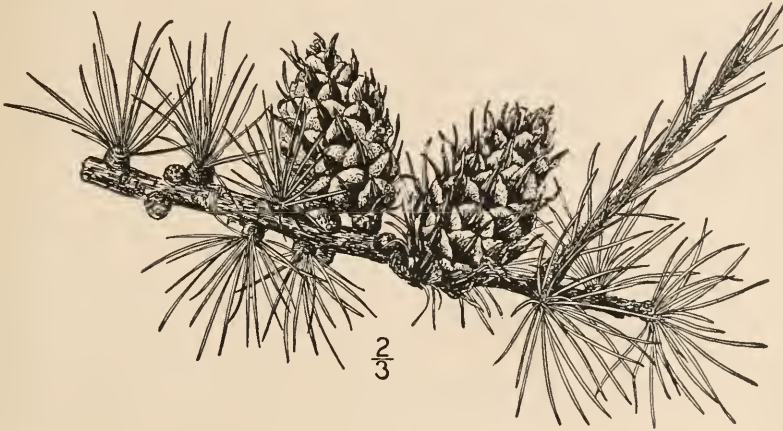


FIG. 41. — Woolly Larch.

The branches are usually very irregularly divided, in rather remote whorls, elongated, pendulous or the upper ascending, forming a very irregular head. The bark on old trees is 1.5 to 2 cm. thick, shallowly fissured into irregular plates composed of loose dark red scales; on younger trees it is thin, smooth, somewhat shining, and yellowish gray. The stout twigs are thickly coated with brown hairs, becoming smooth and nearly black after several years and armed with stout blunt branchlets 1.5 to 2 cm. long. The winter buds are characterized by the white matted hairy margins of their scales. The four-sided leaves are slender, needle-like, rather sharp-pointed, 2.5 to 4 cm. long, and light green. The staminate flowers are oblong, short-stalked, and pale yellow. The pistillate flowers are ovoid-oblong to ovoid, yellowish green tinged with purple. The cones are short-stalked, oblong, 3.5 to 4.5 cm. long, 2 cm. thick, somewhat pointed at the apex, and fall off during the first winter; their numerous scales are thin, oblong to obovate, reddish or sometimes green, their margins toothed, and more or less fringed with hairs; when mature the scales spread widely from the stout hairy axis; the bracts are large and much exerted beyond the scales, long, slender-tipped and purplish. The seed, which is shed during the first autumn, is obliquely oblong, 3 mm. long, half the length of its shining light reddish wing.

The wood is hard, coarse-grained, and red-brown; its specific gravity is about 0.70. It is not as yet an article of commerce.

III. THE SPRUCES

GENUS **PICEA** LINK

CONTAINING about 18 or 20 species of tall conic trees, the genus *Picea* is confined to the cooler regions of the northern hemisphere; in America they range northward in the mountains from the Carolinas and New Mexico to Canada, where they extend across the continent and north to the Arctic Ocean. They are usually trees of considerable stature, except where reduced by altitude or latitude.

The trunks are straight, gradually tapering to the top, often quite thick and enlarged at the base, and have scaly, seldom deeply channeled bark. The branches are in whorls at regular intervals, slender, horizontal, or sometimes drooping; the branchlets are pendulous. The winter buds are covered by many scales, the outer ones being the thickest, and persist for a time as a ring around the base of the newly formed twig, leaving, when falling, a ring-like scar. The leaves are linear, 4-sided, and bear stomata on all sides; or they are sometimes flattish and have stomata on the upper side only; they are spirally arranged on the branchlets, pointing in all directions, seldom appearing 2-ranked, sometimes incurved, usually pointed, and contain 1 or 2 resin-ducts close to the lower epidermis and are jointed to narrow cylindric persistent woody stalks called sterigmata, from which they fall in the course of seven to ten years or upon drying. The flowers are monœcious, appearing early in the spring from buds of the previous year. The staminate inflorescence is axillary, surrounded by enlarged bud-scales, stout, stalked, and erect, sometimes nodding on long stalks, yellow or scarlet; the numerous spirally disposed anthers open lengthwise. The pistillate inflorescence is terminal, oblong to cylindric, erect on short stalks, and pale yellow to scarlet. The cones are ovoid to oblong, pendulous, stalkless or short-stalked, maturing the first season, falling off during the following winter or remaining for many years; their persistent scales are obovate, or rhomboidal, entire or variously toothed, much longer than the bracts, gradually diminishing in size, and sterile toward each end of the cone. The two seeds at the base of each fertile scale are obliquely ovoid or oblong, usually pointed at the base, crustaceous, and of various shades of brown, the wing large; cotyledons 4 to 15.

The spruces are among the most valuable timber-producing trees of the northern hemisphere. The resinous exudations of some of the species are used as are the "turpentine" from allied genera. They are abundantly represented by fossil leaves in the Miocene epoch of Europe. *Picea* is the old classic name of the Spruce, the type species being the Norway spruce, *Picea Abies* (L.) Karsten, of Europe.

Leaves 4-sided.

Eastern and northern trees; cone-scales very obtuse.

Twigs and sterigmata smooth, often glaucous; cones oblong-cylindric. 1. *P. canadensis*.

Twigs hairy; cones ovoid to oval.

Leaves not glaucous; cones early falling.

Leaves glaucous; cones long persisting.

Western trees.

Cone-scales very blunt; cones 2 to 4.5 cm. long; twigs smooth.

Cone-scales rhomboid, more or less acute; cones 5 to 10 cm. long.

Twigs hairy; leaves not stiff.

Twigs smooth; leaves stiff.

Leaves flattened.

Twigs hairy; leaves blunt-pointed.

Twigs smooth; leaves sharp-pointed.

2. *P. rubens*.

3. *P. Mariana*.

4. *P. albertiana*.

5. *P. Engelmannii*.

6. *P. pungens*.

7. *P. Breweriana*.

8. *P. sitchensis*.

1. WHITE SPRUCE — *Picea canadensis* (Miller) B. S. P.

Abies canadensis Miller. *Picea alba* (Aiton) Link

Also called Single spruce, Skunk spruce, Cat spruce, Double spruce, and locally known as Spruce and Pine, this extends across the entire northern portion of the continent, if the western tree is, as supposed to be, identical with the eastern, from Newfoundland and Labrador to Alaska; eastwardly its southern limits are in South Dakota, peninsular Michigan to northern New York, reaching the Atlantic coast in southern Maine. It attains its greatest development in northern British America, a maximum height of about 35 meters with a trunk diameter of 1 meter. In its eastern range, however, it seldom reaches half these dimensions. It prefers moist hillsides or the borders of rivers or swamps.

The branches are long, stout, and upwardly curved, their branchlets stout, stiff, and pendulous. The bark is 6 to 12 mm. thick and broken into irregular scaly plates which separate easily and are light brownish gray. The twigs are nearly smooth, grayish green becoming orange-brown and finally dark grayish brown. The winter buds are broadly ovoid and blunt, from 3 to 6 mm. long, their scales light brown and fringed. The leaves, which sometimes have a pronounced polecat odor, are 4-sided, 1 to 2 cm. long, sharply stiff-pointed, light bluish green or grayish at first, becoming pale blue or blue green with age and marked by several rows of stomata on each surface; they are crowded toward the upper side of the twigs by a twist of the under ones, incurved and point toward the end of the twig, those of the fertile branchlets being about half the length of the others. The staminate flowers are oblong-cylindric, 1.5 to 2 cm. long, reddish, becoming yellow, and borne on long slender stalks. The pistillate flowers are of similar shape, a little longer, pale reddish or yellowish green and sessile. The cones are nearly sessile, oblong-

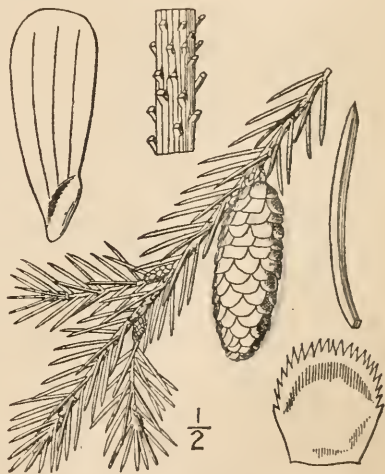


FIG. 42. —White Spruce.

cylindric, 5 to 7 cm. long, 1 to 2 cm. thick, narrowed toward each end, bluntly pointed, pale green to crimson, becoming pale brown or dark brown and shining; they fall off soon after shedding their seed in the autumn or early winter; their scales are almost orbicular or slightly longer than broad, thin and flexible, notched, blunt, rounded or bluntly pointed at the apex, the margins usually entire; the seed is about 3 mm. long, pale brown, its wing obliquely rounded.

The wood is soft, weak, straight-grained, light yellow and satiny; its specific gravity is about 0.40. It is the principal soft wood timber of eastern Canada and is used extensively in general carpentering and in the manufacture of paper pulp. The northwestern Indians are supposed to use the roots in their basketry. The resinous exudation furnishes some of the spruce gum of commerce.

As an ornamental tree it has few superiors among our native evergreens for cold northern sections, but in the United States, except north of central New England, it does not thrive well in cultivation.

2. RED SPRUCE — *Picea rubens* Sargent

Abies rubra Poiret. *Pinus rubra* Lambert. *Picea rubra* (Poiret) Dietrich

Variously called Black spruce, Double spruce, Blue spruce, Spruce, He balsam and Spruce pine, some of which perhaps are more appropriate to the Swamp spruce, this occurs from Prince Edward Island to northern New York, southward to Cape Cod, continuing further south in the highlands and mountains to North Carolina, but it is not known to occur west of the Alleghany Mountains. Its maximum height of 35 meters with a trunk diameter of one meter is attained in the highlands of New York and New England.

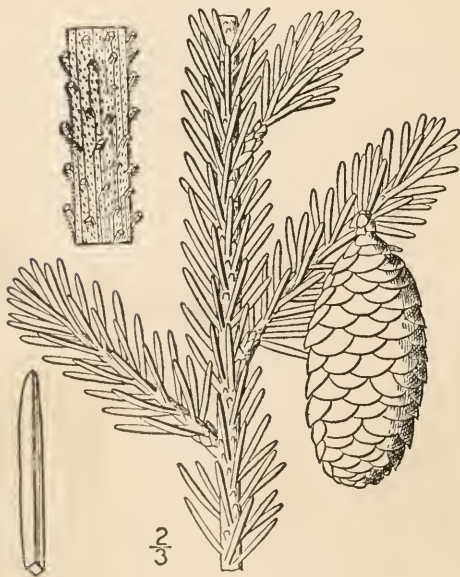


FIG. 43. — Red Spruce.

The branches are slender and spreading, forming a conic tree with branches to the ground, when in the open; in the thick woods, however, it is usually devoid of branches for much of its length and at higher altitudes it is frequently reduced to a straggling shrub. The bark is 7 to 15 mm. thick, much fissured and broken into irregular, close scales of a

red-brown color. The stout twigs and persistent leaf-stalks are covered with pale hairs, light yellow, becoming dark brown with darker hairs, and finally nearly black. The winter buds are ovoid, sharp-pointed, their scales close, light red-brown and sharply pointed. The 4-sided linear leaves are about 16 mm. long,

scarcely 1 mm. wide, rounded, sharp or thickly taper-pointed, incurved, somewhat crowded and pointing outward in all directions from the twig, very shining, dark green, the upper sides bearing several rows of stomata on each side of the rounded midrib; the lower sides marked with fewer stomata. The staminate flowers are oval, nearly sessile, 13 mm. long and reddish. The pistillate flowers are oblong-cylindric, about 12 mm. long. The ovoid to oblong cones are 3 to 5 cm. long, narrowed toward the base and apex, short-stalked, purplish green, red-brown when mature, and usually fall off during the first winter or early summer. The scales are broadly obovate, rounded and entire or nearly so on the thin flexible margin, red-brown and shining. The dark brown seeds are 3 mm. long with a broad wing 6 to 8 mm. long.

The wood is soft, weak, close-grained, not durable, pale reddish yellow, and its specific gravity is about 0.45. It is used largely in general carpentry, in the manufacture of paper pulp, and for musical instruments. Its resinous exudation supplies much of the "spruce gum," and an infusion of the young twigs and leaves forms the basis of the old-time spruce beer.

Owing to the confusion of this and the closely related and less desirable Swamp spruce, *Picea Mariana*, this tree has not been brought into cultivation as extensively as it deserves to be, as it is one of the most desirable of the Spruces for ornament in North America and Europe, its chief drawback being its slow growth.

3. SWAMP SPRUCE — *Picea Mariana* (Miller) B. S. P.

Abies Mariana Miller. *Picea brevifolia* Peck. *Picea nigra* (Aiton) Link

This spruce, which is also called the Black spruce and frequently receives the many other names applied to our Red spruce by those who do not differentiate the two species, is an inhabitant of *Sphagnum* bogs or their borders, except in the north, where it also occurs on mountain tops and slopes, often reduced to a shrub, and in valleys. It is known from Labrador across the continent to Alaska south to New York, and in the mountains into Pennsylvania, and to Wisconsin and Saskatchewan, attaining in its greatest development a height of 30 meters with a trunk diameter of 9 dm.

The branches are relatively short and slender, usually pendulous, the ends often turning upward, forming an open irregular conic tree, with branches close to the ground when growing in the open. The bark is 6 to 13 mm. thick, fissured into irregular, thin, close brownish scales. The twigs are slender, covered with brown hairs, light brown becoming smooth and darker with age. The winter buds are ovoid,

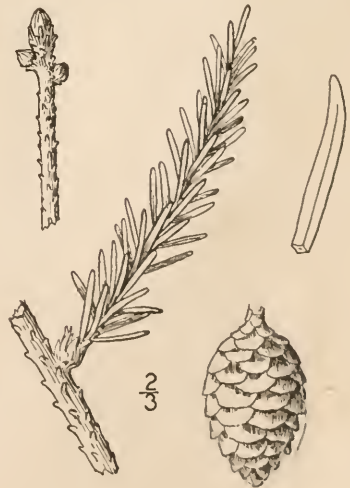


FIG. 44. — Swamp Spruce.

sharply pointed, about 3 mm. long, their closely fitting light red-brown scales minutely hairy. The 4-sided leaves are from 0.5 to 1.5 cm. long, somewhat narrowed toward the blunt tip, slightly incurved, standing outward in all directions from the branches; they are light bluish or glaucous green, lighter on the upper surface with many stomata, shining beneath. The staminate flowers are oblong or cylindric and reddish. The cones are ovoid, 2 to 3 cm. long, pointed at the end, rounded or narrowed at the base into a short, bent stalk, which is covered with persistent bracts; they are dull purplish brown when mature and often become nearly globular when the scales expand, remaining on the tree for many years; their scales are nearly orbicular, stiff, rounded, irregularly notched or entire; the seed is oblong, about 3 mm. long, dark brown, its wing pale brown and shining.

The wood is soft, weak, coarse-grained, yellowish white with a specific gravity of about 0.52. It is seldom sawed into lumber except in the region of its greatest development, Manitoba, where it is utilized as the Red spruce is eastward. In cultivation it has proven a failure on account of losing its lower branches and otherwise becoming unsightly. Forms of this tree with large cones sometimes very closely resemble the preceding species.

SOUTHERN SPRUCE — *Picea australis* Small

Picea alba Chapman, not Link

This occurs on summits and rocky slopes of mountains in Virginia and North Carolina. To determine whether it is really a distinct species requires further investigation, as it is imperfectly known. It differs from the Red spruce in its more slender, less hairy twigs with smoother sterigmata, more slender, acute light green leaves and much smaller cones, which are said to fall off directly after shedding their seed. From the Swamp spruce it differs in its habitat, its bright green foliage and brighter, early deciduous cones.

This spruce attains a maximum height of 40 meters and a trunk diameter of 1.5 meters. Its bark is comparatively smooth. The leaves are slender, usually straight, 8 to 14 mm. long, less than 1 mm. thick and sharp-pointed. The oval or ovoid cones are bright green when young, 2.5 cm. long, red-brown at maturity.

4. WESTERN WHITE SPRUCE — *Picea albertiana* Stewardson Brown



FIG. 45. — Western White Spruce.

This recently described species ranges from Wyoming and Montana north and westward into British Columbia, sometimes attaining a height of about 25 meters with a trunk diameter of 1 m., though often smaller.

The branches are short and stout. The twigs are rather slender, smooth, and light yellow, becoming darker with age. The leaves are slender, sharp-pointed,

bluish green, and marked with numerous stomata on all surfaces; they are crowded on the upper sides of the twigs and become darker in age. The staminate flowers are oblong-cylindric, about 12 mm. long, short-stalked and yellowish. The pistillate flowers are similar in outline, but larger, and nearly sessile. The cones, which are early deciduous, are ovoid, 2 to 4.5 cm. long and brown, their scales obovate, rounded and entire or slightly wrinkled on the margins; bracts 2 mm. long or less, with angled, acute cross tips; seeds about 3 mm. long, the wing obovate, light brown, shining.

This species has been confused with *Picea canadensis*, which has smaller sterigmata and longer and narrower cones.

5. ENGELMANN'S SPRUCE — *Picea Engelmanni* (Parry) Engelmann

Abies Engelmanni Parry. *Picea columbiana* Lemmon

Engelmann's spruce ranges from British Columbia to Oregon, east to Alberta, and south through the Rocky Mountains to northern New Mexico and Arizona, sometimes forming great forests and attaining a maximum height of about 45 meters with a trunk diameter of 1.5 m.

The branches are slender and spreading in close whorls, forming a compact narrow cone; on old forest trees the branches disappear for a considerable height, leaving a short narrow dense conic head. The bark is up to 15 mm. thick and deeply furrowed, red-brown to purplish brown. The twigs are rather stout, somewhat hairy, greenish yellow, gradually becoming dark yellow-brown. The winter buds are conic, rather blunt, covered by pale brown thin-edged scales. The leaves, which emit a polecat-like odor when bruised, are 2 to 2.5 cm. long, slender, soft, and flexible, sharply thick-tipped, marked with several rows of stomata on each face, pale bluish green when young, darker when old. They are nearly straight and spread in all directions, those on fertile twigs often shorter, stouter, and incurved. The staminate flowers are oblong-cylindric, 15 mm. long, short-stalked and purplish; the pistillate flowers are nearly the same shape and size as the staminate, sessile or nearly



FIG. 46. — Engelmann's Spruce.

so, light red. The cones, which are abundantly produced, are elliptical, 5 to 7 cm. long, light green with a reddish tinge when young, light brown and shining when ripe, falling off soon after the seeds have dropped out; their scales are subrhomboid, thin and firm, somewhat concave, usually broadest near the middle and irregularly toothed at the apex; the bracts are truncate or pointed, 4 to 6 mm. long. Seed blunt and thickened at the base, about 3 mm. long, its wing wedge-shaped, twice as long as the seed, oblique and light brown.

The wood is soft, rather weak, close-grained, pale yellowish brown; its specific gravity is about 0.34. It takes a fine polish and is used in general carpentry, for fuel, and charcoal. The bark is rich in tannin and is used to some extent in tanning leather.

As an ornamental, this tree is very desirable and stands the climate of the northeastern States very well, but is a very slow grower.

It is also called White spruce, Mountain spruce, Arizona spruce, Balsam, and White pine.

6. BLUE SPRUCE — *Picea pungens* Engelmann

Picea Parryana (Andre) Sargent. *Abies Menziesii Parryana* Andre

Also called Colorado blue spruce, Parry's spruce, Prickly spruce, White spruce, Silver spruce, and locally Spruce or Balsam, this occurs in New Mexico, Colorado, eastern Utah and Wyoming, at elevations of from 1800 to 3000 meters; it attains a maximum height of 45 meters with a trunk diameter of 9 dm.

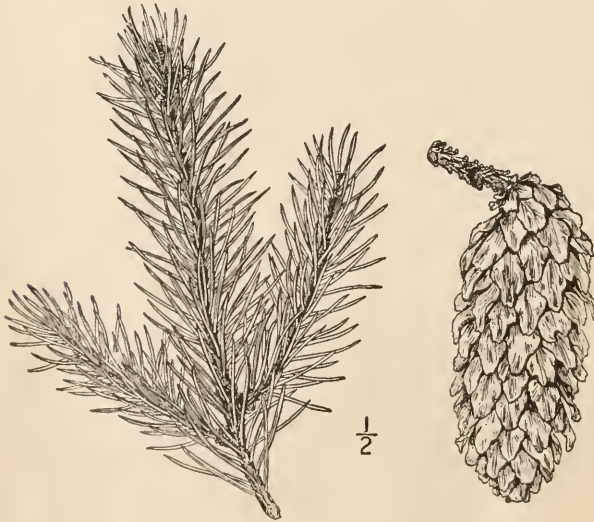


FIG. 47. — Blue Spruce.

The branches are stout, stiff, horizontal, rather far apart and in whorls, gradually shorter toward the top, forming a loose, symmetrical cone-shaped tree. The branchlets are stiff, somewhat erect with age, the trees often becoming irregular in outline by the elongation of some of the upper branches

and the dying off of the lower ones. The trunk also is frequently forked into two or more secondary stems. The bark is 2 to 4 cm. thick, deeply fissured into broad, rounded ridges composed of close scales of a gray or brown-red color; the younger bark is lighter in color and not fissured. The stout, stiff twigs are smooth, green, and covered with a slight bloom, becoming orange-brown and finally gray

or brown with age. The stout winter buds are mostly blunt-pointed, 8 to 15 mm. long, covered with thin brown scales. The leaves are stout, stiff, 4-sided, 1.5 to 3 cm. long, sharply thick-pointed, bluish green or bluish white, changing to dark, blue green with age; they are provided with several rows of stomata on every side, those on the upper sides being the most conspicuous; the leaves point forward and outward from all sides of the twigs and are strongly incurved, those of the fertile branchlets being much the shortest. The staminate flowers are oblong-ovoid and reddish yellow; the pistillate flowers nearly cylindric and light green. The cones are oblong-cylindric, somewhat narrowed toward each end, 5 to 10 cm. long, 2.5 to 4 cm. thick, reddish green, becoming red-brown and shining, usually persisting until the second winter. The scales are flattish, rhombic, blunt, and irregular at the narrowed apex. The seeds are 3 mm. long, scarcely half the length of their rounded, wedge-shaped wing.

The wood of the Blue spruce is soft, weak, close-grained, light brown to nearly white and satiny; its specific gravity is about 0.37. Its use is purely local.

This most variable yet beautiful spruce is admired for its abundance of bluish leaves and its rapid growth. It thrives well in cultivation over a greater part of the central and eastern United States, also in Europe; unfortunately it loses much of its beauty and grows slowly and unsatisfactorily after reaching a height of 12 meters or more.

7. WEEPING SPRUCE — *Picea Breweriana* Watson

This beautiful tree is also called Brewer's spruce. It is very rare and local, being known only from the mountains on either side of the California-Oregon State line, having for its center the Siskiyou mountains, on the dryish sides of which it occurs at an altitude of 1200 to 2250 meters, attaining a maximum height of 36 meters, with a trunk diameter of 9 dm. exclusive of the usually swollen base.

The branches are crowded, horizontal, or pendulous below, somewhat ascending and shorter near the top; the lateral branchlets are very slender and pendulous, and, as it seldom grows in crowded positions, is clothed to the ground. The bark is 1.5 to 2 cm. thick, fissured into long, thin, closely scaly plates of a reddish brown color. The twigs are finely hairy, reddish brown, becoming smooth and dark grayish brown with age. The winter buds are conic, 6 to 7 mm. long, and half as thick, their scales thin and light brown. The leaves are linear, flattish, 2 to 3 cm. long, about 1.5 mm. wide, narrowed and blunt at the end, straight or nearly so; the upper surface is marked by a prominent midrib and several rows of stomata, the lower surface is slightly ridged, dark green and shining. The staminate flowers are oblong, about 2 cm. long, and reddish purple. The pistillate flowers are oblong-cylindric, 2.5 cm. long and over one third as thick. The oblong cones are 6 to 12 cm. long, 2 to 3 cm. thick, narrowed toward both ends, rather sharply pointed, obliquely rounded at the base, at first purple, orange-brown and dull when ripe, opening late in the autumn and persist until



FIG. 48. — Weeping Spruce.

the second winter when the scales are strongly reflexed. The bracts are small and inconspicuous. The dark brown seed is rounded at the base, 3 mm. long, one fourth the length of the broad rounded wing.

The wood is soft, close-grained, and compact, light brown and shining and the heaviest of the spruces, its specific gravity being about 0.51; its rarity and inaccessibility have prevented any economical application.

The rarest and probably most beautiful of the American spruces, with its long, gracefully weeping branches, has so far resisted all known attempts toward its cultivation, and, except for small specimens transplanted

from its forest home to gardens close by, it has refused to thrive.

8. TIDELAND SPRUCE — *Picea sitchensis* (Bongard) Carrière

Pinus sitchensis Bongard

This, the tallest of our spruces, is also called Sitka spruce, Menzies' spruce, Western spruce, and Great tideland spruce. It occurs in swampy or moist land from Kadiak Island, Alaska, southward to Mendocino county, California, and is essentially a seaboard tree, but ascends the coastal mountains to an altitude of 1000 meters where it is greatly reduced in stature; in the north it is a low shrub. Its maximum height of 90 meters with a trunk diameter of 4.5 meters is attained in the great forests of the rich river valleys of Oregon and Washington.

Its trunk is much enlarged and buttressed at the base. The branches of uncrowded old trees are nearly horizontal, and often very long; on young trees they are more upright and closely set, forming an open cone with a narrow top. In the denser forests the trunks are bare for over half their length. The bark is 1 to 2 cm. thick and broken into large, thin, irregular, rounded loose scales of a dark reddish color; on young trees the bark is usually brighter red. The stout, stiff twigs are smooth, light green, becoming yellowish and finally dark brown with age. The winter buds are conic or ovoid, about 1 cm. long, sharp-pointed, their ovate scales brown and shining. The leaves, which radiate outwardly in all direc-

tions from the stem, are stiff, straight, or but little incurved, linear, 1.5 to 2 cm. long, 1 to 1.5 mm. wide, flat, with an abruptly thick tip; their upper surface is whitish with several rows of stomata on each side of the slight ridge, the under side is somewhat rounded or keeled, green and shining. On vigorous, sterile branchlets the leaves are larger and much whiter. The staminate flowers, which are very abundant at the end of the smaller branchlets, are oblong-cylindric, 2.5 cm. long, darkish red and subtended by an ample involucre of enlarged bud-scales. The pistillate flowers, produced at the ends of the stiff, terminal branchlets, are oblong, obtuse, 2.5 cm. long. The cones are pendent, oblong-cylindric, 5.5 to 10 cm. long, 2.5 to 4 cm. thick, at first yellowish, at maturity yellow to red-brown, shining; they fall off during the first winter; their oblong scales are thin, stiff, rounded, and slightly toothed. The bracts, which are half the length of the scales, are stiff, lanceolate, and slightly toothed. The seeds are pale red-brown, about 2 mm. long, their oblong wing being about 12 mm. in length.



FIG. 49. — Tideland Spruce.

The wood is soft, straight-grained, light reddish brown; its specific gravity is about 0.42. It is the principal lumber of Alaska and is extensively used in Washington for general carpentering, boat building, and paper pulp.

This is one of the handsomest of spruces and thrives well in Europe, but in the eastern United States it is unable to withstand the extreme and frequent changes of the weather.

IV. THE HEMLOCKS

GENUS **TSUGA** [ENDLICHER] CARRIÈRE



EIGHT species of Hemlocks are known, tall, straight trees, which occur, like the allied genera, only in the cooler portions of the northern hemisphere, but are absent in Europe. North America has four, and Asia the same number. The type is the Japanese *Tsuga*.

Their leaves are linear, flat (or angular in one species), blunt-pointed or notched, narrowed abruptly at the base, entire or minutely spiny-toothed, appearing two-

ranked, except in one species, stomatiferous on the under side only, except in one species, and contain a single resin-duct near the epidermis of the under side; they are articulated to short, persistent woody stalks, from which they separate on drying, but in life persist for several years. The flowers, which are monœcious, appear in early spring from buds formed the previous season. The staminate are axillary, subglobose, and short-stalked; the many short-stalked anthers are two-celled, nearly globular, opening crosswise, the connective projecting above



FIG. 50. — Canadian Hemlock, New York Botanical Garden.

the sacs into a short pointed tip. The pistillate flowers are terminal, short-stalked, oblong; the broad scales bear two ovules at the base; their bracts are inconspicuous. The cones, ripening the first season, are usually pendulous, ovoid to oblong, blunt-pointed, consisting of persistent loosely overlapping, concave, thin, woody scales, which are somewhat smaller and sterile toward the ends of the cone; the bracts are much shorter than the scales; the seed is ovate-oblong, flattened, amply winged, crustaceous, with fleshy endosperm and 3 to 6 cotyledons.

The name is Japanese, *Tsuga* being the name for two of their most important timber trees.

The astringent bark of all the species is extensively used in tanning.

Cones ovoid to oval; leaves blunt or notched, flat.

Eastern trees; cones stalked.

Northern tree; cone-scales nearly round, appressed.

Southern tree; cone-scales oblong, longer than wide, spreading.

Western tree; cones sessile.

Cones cylindric to oblong-cylindric; leaves keeled above; western tree.

1. *T. canadensis*.

2. *T. caroliniana*.

3. *T. heterophylla*.

4. *T. Mertensiana*.

1. CANADIAN HEMLOCK — *Tsuga canadensis* (Linnaeus) Carrière

Pinus canadensis Linnaeus

This well-known tree, also called Hemlock spruce, New England hemlock, Spruce, and Spruce pine, occurs from Nova Scotia to Alabama, and west to Minnesota; south of New Jersey, however, it is found mostly in the mountains; at the north it forms extensive pure forests, reaching its maximum height of 31 meters, with a trunk diameter of 12 dm.

The branches are long and slender, horizontal, or drooping below, ascending above, forming a dense beautiful conic tree. The bark is 0.5 to 2 cm. thick, furrowed into flat, connected plates, covered by rounded scales, grayish brown to purplish red. The slender twigs are hairy and yellowish brown, becoming smooth and gray-brown or purplish red. The winter buds are rather blunt-pointed and light brown. The leaves are linear, 6 to 14 mm. long, rounded or sometimes



FIG. 51. — Canadian Hemlock.

notched at the end, entire or somewhat toothed and revolute toward the apex, yellowish green when young, dark green, shining and furrowed above, whitish and stomatiferous beneath; they persist for about three years. The staminate flowers are globular, 2 mm. long and yellowish. The pistillate flowers are oblong, 5 mm. long, and pale green. The cones are short-stalked, ovoid, 1.5 to 2.5 cm. long, rather blunt-pointed, red-brown, maturing in the autumn and shedding their seed during the first winter, falling off during the next season; the scales are nearly orbicular, their tips brownish, spreading but little on shedding the seeds, which are oblong, about 4 mm. long, and have several resin cells; the wings are about 8 mm. long, obliquely oblong, blunt.

The wood is soft, brittle, and weak, coarse-grained, not durable, light reddish brown; its specific gravity is about 0.42. It is extensively used in carpentry, especially for frame-work in the regions of its greatest abundance. The bark is largely used in tanning leather, being the most important substance so used in North America. It is also occasionally employed in medicine for its astringent properties. An oleoresin obtained from the wood and bark is called Canada pitch, and the volatile oil distilled from the leaves is used as a curative agent.

As an ornamental tree the Canadian hemlock has long been a favorite in the northern States and Canada. The principal objection to it is its slow growth.

2. CAROLINA HEMLOCK — *Tsuga caroliniana* Engelmann

This Hemlock, also called Crag hemlock, Southern hemlock, and Hemlock, is a rather local tree, being found on the rocky slopes and stream banks of the Blue Ridge Mountains of Virginia, the Carolinas, and northeastern Georgia. It is rarely abundant, but grows among the Canadian hemlock, White pine, and various deciduous trees. It reaches a maximum height of 25 meters, with a trunk diameter of 1 meter.

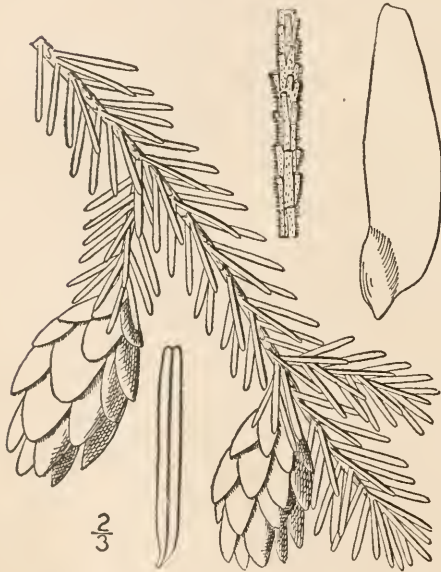


FIG. 52. — Carolina Hemlock.

The branches are stout, relatively short, the lower pendulous, forming a compact cone; the bark is 2 to 2.5 cm. thick, fissured into broad, flat, obliquely confluent ridges and broken into thin close scales of a red-brown color; the slender twigs are orange-brown, and covered with short dark hairs, becoming smooth and dull brown with age. The winter buds are blunt, dark red-brown, their scales somewhat hairy. The leaves

are linear, 1.5 to 2 cm. long, 1 mm. wide, rounded or notched at the end, grooved, dark green and shining above, light green, with numerous stomata, and revolute-margined beneath; they persist for about five years. The staminate flowers are ovoid, 3 mm. long, of a purplish color. The pistillate flowers are also purplish. The cones are oblong, 3 to 3.5 cm. long, short-stalked and dull brown when ripe; the scales are oblong, 2 cm. long, half as wide, thin, concave, rounded at the apex, abruptly narrowed at the base, slightly grooved and minutely hairy on the outer surface, finally spreading widely from the axis of the cone; the bracts are small, rounded or truncate at the apex, wedge-shaped at the base; the ovoid seed is 4 mm. long and covered by resin cells; the wing is about four times the length of the seed.

The wood is rather soft, brittle, weak, coarse-grained, and light brown; its specific gravity is about 0.43. It is not an article of commerce.

It thrives well in cultivation, and is, perhaps, even more beautiful than our northern Hemlock.

3. WESTERN HEMLOCK — *Tsuga heterophylla* (Rafinesque) Sargent

Abies heterophylla Rafinesque. *Tsuga Mertensiana* Engelm., not Carrière

This, the largest of its genus, is also variously called Western spruce, Western hemlock spruce, Prince Albert spruce, Alaska pine, and Hemlock. It is abundant in southern Alaska, southward to Mendocino county, California, extending eastward into Montana and Idaho. It grows in rich, moist soil near the coast, and along streams up to an altitude of 1900 meters, reaching its maximum height of 60 meters and a trunk diameter of 3 m. in the fertile valleys nearest the coast.

The slender branches are short and pendulous, forming a narrow cone. The bark of old trees is 3 to 4 cm. thick, deeply fur-



FIG. 53. —Western Hemlock.

rowed into oblique ridges and breaking into thick irregular scales of a dark red-brown color; the younger bark is quite smooth, shallowly fissured into flat plates of a dark orange-brown color. The slender twigs are long-hairy, pale brown, becoming dark red-brown and thinly scaly with age. The winter buds are ovoid and light brown. The leaves are linear, flat, 1 to 2 cm. long, about 1 mm. wide, entire or minutely spiny-toothed toward the blunt apex, entire and tapering abruptly to the slender woody leaf-stalk; they are dark green, shining, and deeply grooved on the upper side, pale green and marked by rows of white stomata beneath. The staminate flowers are oblong, about 5 mm. long, and yellow. The pistillate flowers are terminal, oblong-cylindric, about 10 mm. long, and purple. The sessile cones are oblong to oval, 2.5 to 3 cm. long, 10 to 15 mm. thick, tapering both ways from the middle, light red-brown when mature, the scales thin, slightly ridged and hairy on the outer side, longer than broad, sometimes narrowed at about the middle or below; the bracts are rounded, abruptly pointed and pur-

plish; the seeds are about 3 mm. long and provided with a few oil glands; the broad based wing is two or three times the length of the seed.

The wood is rather hard, tough, close-grained, and pale yellowish brown; its specific gravity is about 0.51. It is the best of the American hemlocks, takes a good polish, and is becoming more extensively used in carpentry. The bark is rich in tannin, and in the Northwest furnishes the best tanning material. The inner bark is also used by the Indians as a food; collected in the spring, they beat it into a pulp, then bake it into hard cakes which are kept for winter use. Although this magnificent tree has thrived well in Europe, it has failed in the northeastern United States, probably due to the severe and frequent changes of temperature in the winter.

4. MOUNTAIN HEMLOCK — *Tsuga Mertensiana* (Bongard) Carrière

Pinus Mertensiana Bongard. *Tsuga Pattoniana* (A. Murray) Sénélacuze

Also called Black hemlock, Patton's hemlock, Alpine spruce, Weeping spruce, and Patton's spruce, occurs at high altitudes of the Sierra Nevada and Cascade Mountains, from northern California and Nevada northward to southern Alaska;

eastward it is found in Idaho and Montana. Its maximum height is 30 meters, with a trunk diameter of 3 meters, but above timber line on the higher mountains it becomes a straggling shrub.

The branches are slender, curved, and pendent, the branchlets drooping, their tips often curved upward, forming an open conic tree. The bark of old trees is 2.5 to 4 cm. thick, deeply fissured, with rounded ridges, which are obliquely connected and



FIG. 54. — Mountain Hemlock.

broken into close scales of a red to purplish brown color. The twigs are thin and flexible or short and stiff, dependent upon whether it has grown in moist rich, or dry sterile situations, very hairy, bright red-brown, becoming roughened and gray-brown with age. The winter buds are less than 5 mm. long, sharp-pointed and brown. The linear leaves are 12 to 20 mm. long, 1 mm. or less wide, scattered, and spreading in all directions, entire, blunt-pointed, narrowed toward the base, light blue-green and with stomata on both sides, convex above, rounded and

somewhat striate below; they are more or less curved, usually crowded on the short lateral branchlets, and persist for three to four years. The staminate flowers are globose-oblong, 5 mm. long, borne in the axils of the leaves of short branchlets, on very slender drooping stalks, and bluish in color. The pistillate flowers are erect, cylindric, 6 mm. long, purplish or yellowish green. The cones are cylindric-oblong, 3 to 7 cm. long, 2 to 2.5 cm. thick, narrowed toward both ends, but mostly so toward the blunt apex, erect and purple at first, but usually pendent at maturity and dull brown; they are the largest cones of the genus; the numerous scales are very thin, 10 to 12 mm. long, usually as broad, gradually narrowed from below the apex into a wedge-shaped base, rounded at the somewhat thickened, irregularly eroded apex, striate and slightly rough hairy on the outer side; the bracts are one fourth the size of the scales or less, rounded and short-pointed, wedge-shaped toward the base. The seeds are about 5 mm. long, light brown, with one or two large resin cells on the inner surface, the wing about three times as long, blunt at the apex.

The wood is soft, close-grained, rather weak, pale red-brown; its specific gravity is about 0.44. It is but little used. The bark, like that of other hemlocks, is rich in tannin and is used to some extent in tanning leather.

Unlike any other *Tsuga* the leaves of this species are scattered, stomatiferous on both sides, and the resin-ducts are well within the pulpy portion of the lower side. On these differences Lemmon has suggested its separation into a genus, which he has named *Hesperopeuce*.

Hooker's Hemlock, *T. Hookeriana* (A. Murray) Carrière, a smaller, more slender, short-branched tree of alpine regions, with smaller cones with less spreading and less striated scales, is not regarded as specifically distinct.

V. THE FALSE HEMLOCKS

GENUS **PSEUDOTSUGA** CARRIÈRE



PSEUDOTSUGA comprises three known species, two from western North America, one from Japan. The type species is the North American *P. mucronata*.

They are large conic trees with long whorled branches, usually drooping branchlets and rough furrowed bark. The scales of the winter buds persist for a time as a ring about the base of the newly formed twigs, and when falling off leave a circular scar around the twig. The leaves are flat, crowded, appearing as if 2-ranked by a twist of their stalk, but are in reality spirally arranged and somewhat incurved; the upper surface is rather deeply grooved longitudinally, and the lower side has several rows of stomata on each side of the midrib; a cross-section displays two lateral resin-ducts immediately under the epidermis of the under side. The leaves are attached to the twigs by a persistent woody leaf-stalk, which is usually of the same color as the twig, and from which

the leaves fall away after six or eight years. The flowers appear in early spring from buds formed the previous season, usually erect and surrounded by the thin, large, shining, usually straw-colored bud-scales. The staminate flowers are in the axils of the leaves mostly toward the ends of the twigs, oblong-cylindric, sessile or nearly so, and consist of many spirally arranged, short-stalked roundish anthers which open obliquely, the connective terminating in a short tip. The pistillate flowers are either terminal or sometimes also axillary, oblong, short-stalked, and composed of many ovate blunt, thin, overlapping scales each bearing two ovules, and the much longer, 2-lobed, sharp-pointed, irregularly toothed or cut bracts, whose midrib projects into a long, slender point. The cones, which mature the first season, are ovoid-oblong, sharply pointed at the end, and rounded at the slightly narrowed base; they are drooping, on short, stout stalks, which are surrounded by short linear sharp-pointed bracts; the persistent rounded scales are concave and stiff, becoming smaller and sterile toward each end of the cone, and when ripe and dry stand out at a wide angle to the axis; the bracts, which extend beyond the scales, are two-lobed, and rather stiff, their long midrib protruding into a long, stiff, sharp tip. Seeds, two in the depression at the base of the scales, oblong-triangular; the papery wing is rather dark colored and soon breaks away from the seed; cotyledons 6 to 12.

The name, *Pseudotsuga*, applied to this genus, is a unique combination of Greek and Japanese, signifying False Hemlock.

Cones 5 to 10 cm. long; bracts much exserted.

1. *P. mucronata*.

Cones 10 to 17 cm. long; bracts little exserted.

2. *P. macrocarpa*.

1. DOUGLAS SPRUCE — *Pseudotsuga mucronata* (Rafinesque) Sudworth

Abies mucronata Rafinesque. *Pinus taxifolia* Lambert, not Salisbury

Pseudotsuga taxifolia (Lambert) Britton. *Pseudotsuga Douglasii* (Lindley) Carrière

The Douglas spruce, also called Red fir, Douglas fir, Yellow fir, Spruce, Fir, Oregon pine, Red pine, Puget Sound pine, and Douglas tree, is the most abundant as well as the most widely distributed tree of western North America, occurring from British Columbia southward to the mountains of Arizona and into Mexico, eastwardly to Alberta, Colorado, and Texas at elevations up to 2700 meters. Its area of greatest abundance and dimensions is near the coast at low altitudes in Oregon and Washington, where it forms pure forests of great extent and reaches its maximum height of 90 meters, with a trunk diameter of 4.5 meters. At very high elevations it is sometimes reduced to a straggling shrub.

The branches are crowded, slender, and provided with long, lateral branchlets, pendulous below but erect above, forming a narrow cone from near the ground; in forests its trunk is often branchless for one half of its height or more, leaving a relatively small, narrow head. The bark of old trees is 2.5 to 3 dm. thick, deeply fissured into large, wide, rounded ridges, which are covered with irregular flat

red-brown scales. In dry regions the bark frequently becomes spongy and of a grayish color; on young trees it is thin, rather smooth except for some resin blisters, and dark gray. The twigs are slender, slightly hairy, orange-yellow, and shining, becoming smooth, red-brown, or dark gray. The winter buds are ovoid, sharp-pointed, about 10 mm. long, the scales ovate. The leaves are linear, 2 to 3 cm. long, about 2 mm. wide, nearly straight, bluntly pointed, seldom incurved, light yellow at first, becoming yellowish green or sometimes bluish green; on vigorous shoots they are somewhat larger, slender, and sharply thick-tipped. The staminate flowers are about 2 cm. long, oblong, orange to red, subtended by an involucre of large, thin, papery scales. The pistillate flowers are red to purplish, 2 to 3 cm. long, about 12 mm. thick. The pendent cones are oblong-ovoid, 5 to 10 cm. long, on stout short stalks, purplish at first, yellow-brown when mature, falling off soon after having shed their seeds. The scales are somewhat concave, rounded at the apex, nearly orbicular, slightly irregularly toothed, about 2 cm. long, somewhat less in width; the bracts are 2.5 to 3.5 cm. long, 5 to 7 mm. wide, inversely arrow-shaped and reflexed. The nearly triangular seed is 5 to 7 mm. long, red-brown and shining above, pale and dull beneath; the dark brown wing, nearly twice as long as the seed, is broadest at or below the middle, obliquely rounded at the apex, and soon breaks away from the seed.



FIG. 55. — Douglas Spruce.

The wood varies greatly; it is hard, light red, and coarse-grained, or yellowish and finer grained; its specific gravity is about 0.51. It is the most valuable of the western timber trees, being used for heavy construction purposes which require large timbers, also for ship-building and railroad ties. It is also largely exported. The bark is used for tanning leather.

As an ornamental tree it has long been known and grown in Europe, but was unsuccessful in eastern America until it was discovered that plants raised from seed obtained in Colorado were hardy in the Eastern States, those from the Pacific

slope not being so. It now promises to be one of the most desirable coniferous trees for parks, where it sometimes bears fruit when scarcely 2 meters tall.

2. BIG CONE SPRUCE — *Pseudotsuga macrocarpa* (Torrey) Mayr

Abies Douglasii macrocarpa Torrey

This tree, which is also called Big-cone Douglas spruce, California hemlock, and Hemlock, is of very local occurrence, being known only from dry mountains in southern California, where it grows near the banks of streams and on rocky slopes, at elevations of from 900 to 1800 meters. It is an abundant tree of this



FIG. 56. — Big Cone Spruce.

thinly forested region, reaching a maximum height of 30 meters, with a trunk diameter of 1.2 meters.

The lower branches are relatively long, far apart, drooping below, with stout, or slender branchlets; the upper branches are short and ascending, forming an open conic head. The bark is 7 to 15 cm. thick, deeply furrowed into broad

rounded obliquely connected ridges covered with thick closely adherent scales of a dark red-brown color. The slender twigs are red-brown, slightly hairy, becoming smooth, lighter-brown, and finally gray or brown. The winter buds are ovoid, sharp-pointed, 5 to 7 mm. long, and covered by brown shining scales. The leaves are 2 to 3 cm. long, about 2 mm. wide, slender, thick-tipped, appear 2-ranked by the twisting of the stalk, and incurved, dark blue-gray. The staminate flowers are 2 to 2.5 cm. long, light yellow, and partly enclosed in a scaly involucre. The pistillate flowers are ovoid-oblong, 2.5 cm. long, 1.5 cm. thick, greenish or greenish red. The ovoid cylindric cones are abundantly produced near the top of the tree, and remain on the branches for about a year after shedding their seed; they are short-stalked, 10 to 16 cm. long, about one half as thick; their orbicular concave scales, 5 cm. broad, are thick, woody, broader than long, rounded at the top, wedge-shaped toward the base, eroded on the margin, slightly hairy and striate on the exposed surface; the bracts, which are from 1 to 2 cm. longer than the scales, are widest above, and terminated by a central prolonged tip, and two shorter, somewhat spreading, lateral lobes. The seed is triangular-obovate, 10 to 15 mm. long, about 9 mm. wide, nearly black and shining above, dull and light brown beneath, its wing broadest near the middle, slightly longer than the body, and obliquely rounded at the end.

The wood is hard, strong, close-grained, brown and durable; its specific gravity is about 0.45; it is sometimes sawed into lumber, but its principal use is for fuel.

VI. THE FIRS

GENUS **ABIES** [TOURNEFORT] MILLER



HIS genus includes about 25 species of very symmetrical conic trees, some of immense stature, some, however, reduced to mere shrubs at great altitudes or in the high latitudes. They are confined to cold and temperate regions of the northern hemisphere, occurring in greatest variety in western North America. In addition to the ten species here described, one, *Abies religiosa* Lindl., occurs in the mountains from Mexico to Guatemala.

Our species are all trees with blister-like excrescences on the bark, which, when punctured, exude a viscid oleoresin.

The winter buds are enclosed in imbricated scales, some of which persist at the base of the newly formed twigs for some considerable time, leaving, when falling, a circular scar surrounding the twig. The leaves are evergreen, sessile, persistent for five to ten years, leaving a round scar when falling. They are spirally arranged, but by a twist of the base they appear as if 2-ranked. They are flat, or in some species 4-sided, the margins often thickened and strongly revolute; the apex is notched, rounded or pointed; the upper surface is usually flattened or grooved, dark green and shining, and in some species has stomata; the lower surface is usually marked by a row of stomata on each side of the midrib.

On old and fertile branches the leaves are usually shorter, thicker, and sharper

pointed, more upright, incurved, and crowded than on sterile lower branches. In cross-sections the leaves show two resin-ducts, close to the epidermis on the under side in some species, in others well within the pulpy tissue of the leaf.

The monœcious flowers, appearing in the spring, are produced in the axils of the leaves of the last season's growth. The staminate flowers are short-stalked, pendulous, oval, ovoid, or cylindric, subtended by an involucre of small scale-like bracts which often persist for some time; the subglobose anthers open crosswise, the connective terminating in a short blunt apex. The pistillate flowers are lateral, short-stalked, and erect, with two ovules at the base of the scales, which are shorter than the papery bracts. The erect cones are cylindric to ovoid, frequently covered by globules of a resinous exudation, ripening at the end of the first season, their scales falling away from the persistent stout scarred axis. The densely overlapping scales are thin, curved inward at the usually rounded apex and gradually narrowed to the base, those near each end of the cone sterile. The papery bracts are longer or shorter than the scales and of characteristic outline. The two seeds at the base of the scales are ovoid or oblong, usually acute at the base, somewhat flattened and provided with an ample oblique, papery wing; the embryo, with 4 to 10 cotyledons, is surrounded by fleshy endosperm.

The name applied to this genus is the ancient Latin name of the Fir, *Abies Picea* (L.) Lindley, the old world Fir, which is the type of the genus. Ten species are known to occur in North America:

Eastern trees.

Bracts serrulate, mucronate, shorter than or but little exceeding the cone-scales; leaves mostly obtuse; northern tree.

1. *A. balsamea*.

Bracts aristate, reflexed, much longer than the cone-scales; leaves mostly emarginate; southern tree.

2. *A. Fraseri*.

Western trees.

Bracts without elongated linear tips.

Bracts shorter than the cone-scales or exceeding them but little.

Leaves flat; cones 0.5 to 1.5 dm. long.

Leaves blue-green, glaucous at least when young.

Resin-ducts within the pulp of the leaf.

3. *A. lasiocarpa*.

Resin-ducts immediately under the epidermis of the leaf.

4. *A. concolor*.

Leaves silvery-white beneath, dark green above; resin-ducts immediately under the epidermis.

Bracts obcordate, abruptly short-tipped; leaves notched.

5. *A. grandis*.

Bracts rhomboid to obovate, gradually long-tipped.

6. *A. amabilis*.

Leaves mostly 4-sided; cones 1.5 to 2.8 dm. long.

7. *A. magnifica*.

Bracts much longer than the cone-scales, long-tipped, some of the leaves 4-sided.

Tips of the bracts much smaller than the scales.

8. *A. shastensis*.

Tips of the bracts covering the cone-scales.

9. *A. nobilis*.

Bracts with elongated, narrowly linear flattened tips, two to three times as long as the cone-scales; California tree.

10. *A. venusta*.

1. BALSAM FIR — *Abies balsamea* (Linnaeus) Miller*Pinus balsamea* Linnæus

The Balsam fir, also called Balm of Gilead fir, Balsam, Blister pine, Fir pine, Silver pine, Fir tree, Single spruce, Sapin, and "Cho-koh-tung," meaning "blisters," by the Indians, occurs from Labrador, west to Alberta and southward to the mountains of Virginia and to Minnesota, being most abundant in the regions about the Great Lakes, occurring southward only in the mountains. It grows in swamps or on their borders, usually with spruce and hemlock, occasionally, however, forming forests by itself and reaching a maximum height of 30 meters, with a trunk diameter of 1 meter, but in high altitudes and latitudes it is reduced to a very small tree or a spreading shrub.

The long slender branches, spreading horizontally and sometimes drooping, are in considerably separated whorls, forming a broad symmetrical open conic tree when grown in the open. The bark on large old trees is about 12 mm. thick, smooth, grayish, and marked by numerous swellings that contain an oleoresin, commonly called Canada Balsam.

The slender twigs are finely hairy, yellowish green, changing through yellowish brown to purplish black, becoming smooth with age. The leaves, which become fragrant in drying, are 10 to 22 mm. long, nearly 2 mm. wide, narrowly linear, dark green and shining above, pale green, or when young frequently nearly white and marked by the prominent midrib beneath; on young branchlets they spread outwardly, appearing 2-ranked and are pointed at the apex; on upper fruiting branchlets they are somewhat crowded, curved, nearly erect, and bluntly pointed. The staminate flowers are cylindric, about 6 mm. long, quite yellow. The pistillate flowers are oblong-cylindric, 2 cm. long, and purple.

The cylindric cone, tapering slightly toward the blunt apex, is 5 to 10 cm. long, slightly covered with short hairs; its fan-shaped scales are about 2 cm. long, slightly narrower, twice the length of the obovate bracts, which are finely toothed, notched, and bristle-pointed. The seed is about 6 mm. long, the light brown shining wing being twice as long.

The wood is very soft, coarse-grained, light brown; its specific gravity is about 0.38. It is not durable, and is but seldom sawed into lumber, which is used mostly for crates and boxes. The oleoresin which collects in the vesicles of the bark is



FIG. 57.—Balsam Fir.

gathered in Canada and Maine, by puncturing the bark with a tube, through which the balsam flows into a vessel to which it is attached. It is a greenish yellow, transparent, viscid liquid of an aromatic terebinthinate odor and a bitter, somewhat acrid taste, slowly drying upon exposure into a transparent mass. It is used as an external application to cuts and bruises, and by microscopists in mounting various objects for examination.

As an ornamental tree the Balsam fir has been superseded by the more desirable firs from western America and Asia. It grows rather rapidly.

2. FRASER'S BALSAM FIR — *Abies Fraseri* (Pursh) Lindley

Pinus Fraseri Pursh

This southern fir, also called She balsam Fir, Balsam fir, Silver fir, Healing balsam, Double spruce, Double fir balsam, Mountain balsam, and Lashhorn, occurs in the higher mountains of Virginia and West Virginia to North Carolina and Tennessee, where it sometimes forms forests, and reaches its maximum height of 25 meters, with a trunk diameter of 7.5 dm.

The branches, spreading regularly in whorls, form a fine symmetrical cone until the lower branches decay with age and fall off. The bark is about 1 cm. thick, and smooth, at first, becoming roughened by close papery scales of a red-brown color, changing to gray, and roughened by conspicuous balsam "blisters." The twigs are rather stout, hairy and yellowish brown, becoming smooth and darker with age. The winter buds are about 5 mm. long, blunt and covered with resin. The leaves are flattish, narrowly linear, 1.2 to 2.5 cm. long, nearly 2 mm. wide, and rather thick, somewhat keeled on the lower side, dark green and shining above, white beneath, especially when young; on lower sterile branchlets they are straight, spreading outwardly at right angles; on fertile and upper branchlets they are



FIG. 58. — Fraser's Balsam Fir.

usually crowded, curved, and almost erect, obtuse or sharp-pointed. The staminate flowers are 5.5 to 8 mm. long, almost sessile, and reddish. The pistillate flowers are oblong-oval, light greenish yellow. The erect cones are 5 to 8 cm. long, oblong-cylindric to ovoid-cylindric, rounded at each end, purplish when young; the fan-shaped scales, about 1.5 cm. long, 2 cm. broad, are compactly arranged, becoming dark purple with age; the papery bracts are elongated, longer than the

scales and reflexed over them, yellowish, small-toothed, slightly rounded, and softly bristle-pointed. The seed is about 5 mm. long, its papery, obliquely wedge-shaped wing about twice as long.

The wood is soft, weak, coarse-grained, pale brown; its specific gravity is about 0.35. It is probably never put upon the lumber market, although it is sometimes used for building purposes on the mountains where it grows.

As an ornamental tree its inferior hardiness and general resemblance to the previously described species make it superfluous. Indeed, much of the stock sent out by nurserymen under this name is really nothing but the Balsam fir.

3. WHITE FIR — *Abies lasiocarpa* (Hooker) Nuttall

Pinus lasiocarpa Hooker. *Abies subalpina* Engelmänn

This Fir, variously called White balsam fir, Oregon balsam fir, Alpine fir, Downy cone fir, Mountain balsam, and Pumpkin tree, has probably a greater range than any other American Fir, occurring from Alaska to Washington, Arizona, eastward to Alberta, Montana, Wyoming, Utah, and southern Colorado.



FIG. 50. — White Fir.

At elevations of 1200 to 1800 meters it reaches its maximum height of 30 meters, with a trunk diameter of 9 dm. At the higher elevations of about 3000 meters it is sometimes reduced to a mere shrub.

The branches are short, densely crowded, the lower drooping and sometimes persist almost to the base, forming a narrowly conic sharp-topped tree, narrower

than the other Firs. The bark is 2 to 4 cm. thick, shallowly fissured and broken into irregular close, light red-brown to nearly white scales; the younger bark is thinner, smoother, and gray or nearly white. The twigs are stout, rough, hairy, orange-brown, becoming smooth and light gray to nearly white. The winter buds are subglobose, about 10 mm. long, covered by pointed brown scales, and are resinous. The leaves are crowded, becoming erect by the twisted base, narrowly linear, 2.5 to 5 cm. long, rather thick, bluish-green, shining, becoming darker with age, blunt or notched at the apex, grooved on the upper side; a cross-section shows two resin-ducts well within the pulpy part of the leaf; the leaves on the lower and sterile shoots are thin, closely appressed, and sometimes stiff-pointed; those on upper fertile branches are somewhat thicker, usually sharply thick-pointed, and scarcely half the length of the lower. The staminate flowers are cylindric, 15 to 20 mm. long, 5 to 7 mm. thick, of a bluish color, the pistillate flowers being 2 to 2.5 cm. long, 1 cm. thick, and dark purple. The cones are oblong-cylindric, tapering slightly toward each end from the middle, rounded or flattened at the apex, 6 to 10 cm. long, dark purple and slightly hairy; the scales, which vary greatly in outline, are usually fan-shaped, slightly longer than broad, 2 cm. long, about three times the length of the bracts, which are oblong-ovate, irregularly toothed, rounded, dark brown and abruptly long-tipped. The seed is about 8 mm. long; its wing, which is nearly as long as the scale, is bluish at first, changing to brown.

The wood is soft, weak, not durable, whitish to pale brown; its specific gravity is about 0.34. It is very little used as a commercial lumber.

Its slow growth makes it rather undesirable for ornamental planting, although its narrow form adds a pleasing variety to plantations of coniferous trees.

The oleoresin is collected and used in the West like the Canada Balsam.

4. SILVER FIR—*Abies concolor* Lindley and Gordon

This Fir, also called White balsam, Colorado white balsam, Colorado white fir, and Balsam fir, occurs from the mountains of Oregon to southern California and Lower California and eastward to Wyoming, New Mexico and northern Mexico, at elevations of from 1200 to 3300 meters, sometimes forming almost exclusive forests and reaching a maximum height of 75 meters, with a trunk diameter of 2 meters, though in its eastward range it seldom exceeds half this size.

The bark of very old trees is often 15 cm. thick and deeply furrowed into broad rounded ridges and broken into angular scaly plates of a reddish brown to light gray color; that on younger trees is quite smooth except for many "balsam blisters," which yield, when punctured, an abundance of oleoresin. The twigs are smooth, shining, and dark orange, becoming gray or brown with age. The winter buds are nearly globular, 7 to 12 mm. long, covered with blunt yellowish scales, and very resinous. The leaves are flat, linear, 3 to 6 cm. long, pale bluish green, often with a bloom when young, dull green with age, slightly channeled above, rounded or slightly notched at the apex on the lower branches, shorter, thicker, erect and

curved on the upper fertile branches; a cross-section of the leaf shows two resin-ducts at the epidermis of the under side. The staminate flowers are oblong-cylindric, 10 to 15 mm. long, the pistillate rather narrowly cylindric, 3 to 4 cm. long. The oblong cones are a little narrowed toward each end, rounded or somewhat sunken at the apex, 7 to 15 cm. long, slightly hairy, yellow or green to purple, their fan-shaped scales usually 3.5 to 4 cm. wide, and three fourths as long; the papery bracts, which are scarcely half the length of the scales, are spatulate, toothed, notched, and bristle-pointed. The dull brown seed is about 8 mm. long, the broad, shining, light purplish or brown wing scarcely twice their length.

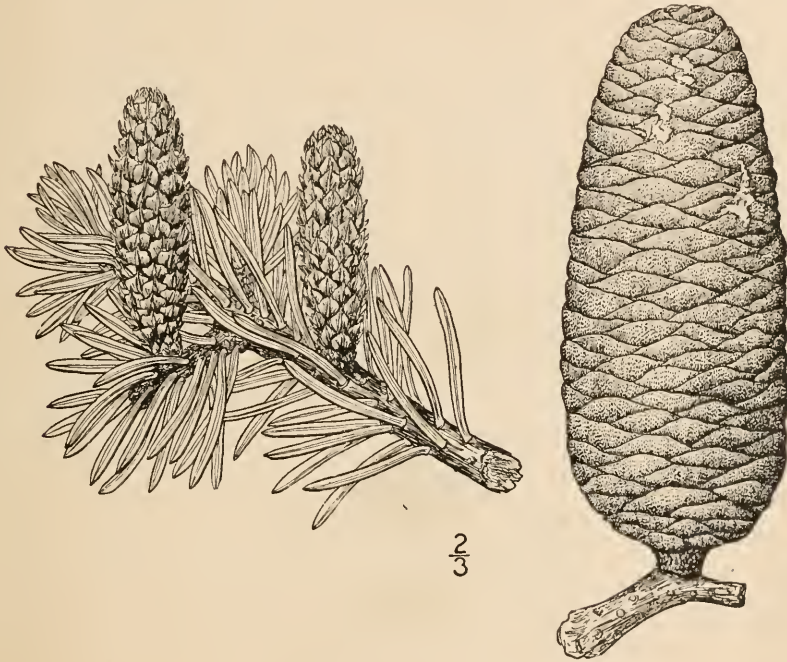


FIG. 60. — Silver Fir.

The wood is very soft, of medium strength, coarse-grained; its specific gravity is about 0.36. It is inodorous, on which account it is largely used in the manufacture of tubs for butter.

Its adaptability to various conditions of soil makes this one of the most satisfactory American coniferous trees for ornamental planting.

Low's fir, *Abies Lowiana* A. Murray, which occurs in the region of Mt. Shasta and southward in California, is considered by some a distinct species; its leaves are darker green and the cones chestnut brown.

5. GREAT SILVER FIR — *Abies grandis* Lindley

This tree, which reaches a maximum height of 90 meters, with a trunk diameter of 1.5 meters, is also called Yellow fir, Oregon fir, Western white fir, Grand fir,

White fir, and Silver fir. It attains its greatest dimensions in the rich bottom lands of the valleys of the northwest coast in British Columbia, Washington, and Oregon, and extends southward into California and eastward into Idaho and Montana, where it reaches an altitude of 2100 meters.

The lower branches are drooping. The bark of old trees is often 5 cm. thick, fissured into low ridges, and covered with thick dark brown scales; that of younger trees is much thinner, quite smooth except for the resin "blisters," and pale grayish. The twigs are rather slender, covered with short hairs, yellowish green changing to red-brown with age. The winter buds are globose, 7 mm. long, and resinous. The flat linear leaves are shining dark green and distinctly grooved on

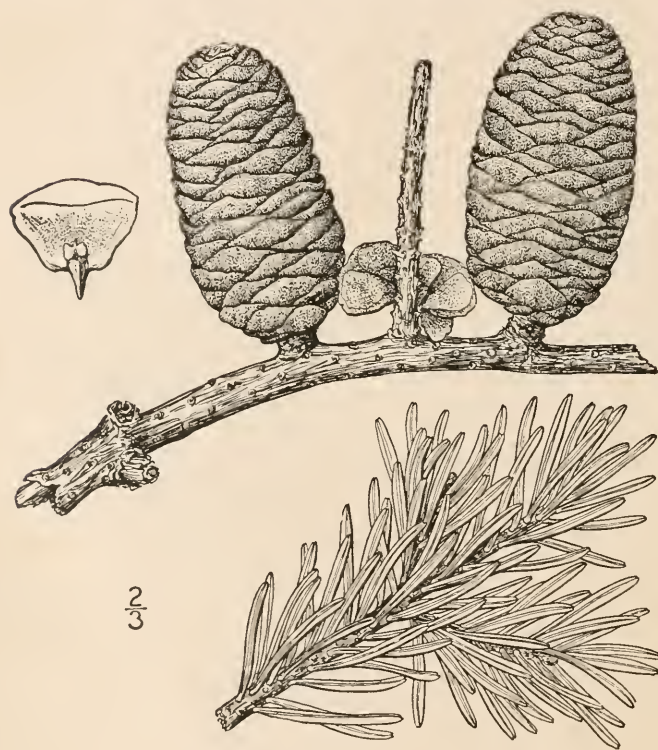


FIG. 61. — Great Silver Fir.

the upper side, silvery white beneath, from 2.5 to 5 cm. long, deeply notched and appearing 2-ranked on the sterile branchlets, shorter, scarcely notched or bluntly pointed, more or less erect and crowded on the fruiting branchlets. The staminate flowers are oblong, 2 cm. long, and bright yellow, the pistillate flowers being narrowly cylindric, 2.5 to 3 cm. long, and pale yellow to green. The cylindric cones are 5 to 10 cm. long, rounded and often sunken at the top, bright green and slightly hairy; the scales are broadly fan-shaped, about 3 cm. wide and

not quite as long, about twice the length of the bracts, which have an obcordate, irregularly toothed and short-pointed apex. The pale brown seeds are about 7 mm. long, half the length of the broad shining wing.

The wood is soft, coarse-grained, not durable; its specific gravity is about 0.35. In Oregon and Washington it is used in carpentry, cooperage, and for paper pulp.

Its growth is said to be the most rapid of the American coniferous trees when in the proper soil and supply of moisture, which, however, is hard to secure in America in any other than its native regions.

6. RED SILVER FIR — *Abies amabilis* (Loudon) Forbes*Picea amabilis* Loudon

This magnificent tree, being all that its name implies, is also called Amabilis fir, Lovely fir, Lovely red fir, Red fir, and by lumbermen erroneously Larch. It occurs from the Columbia River in Oregon northward into British Columbia.



FIG. 62. — Red Silver Fir.

Its greatest size is attained in the Olympic Mountains of Washington, its maximum height being about 75 meters, with a trunk diameter of 1.75 meters. In the dense forests which this tree frequently forms the trunk is naked for about two thirds its height, but in the open it is often furnished all over with short, somewhat drooping branches and branchlets.

The bark of old trees is about 5 cm. thick, irregularly fissured into broad ridges of scaly plates, red-gray to brown; on younger trees the bark is thin, pale or nearly white, and smooth except for the large resin "blisters." The stout twigs, covered with short hairs, are yellowish brown, becoming purplish to red. The winter buds are nearly globular, about 6 mm. thick, covered by close shining scales

and resin. The leaves are flat, shining, dark green and deeply furrowed on the upper side, white, with the midrib prominent beneath; their margins are strongly revolute; those on sterile branches are 2 to 3.5 cm. long, blunt, rounded, or sometimes notched at the apex, and more or less crowded, those on the fertile branches being about half as long and sharply thick-pointed. The staminate flowers are oblong-cylindric, 12 to 20 mm. long, slender-stalked, and bright red, the pistillate flowers being rather narrowly cylindric, 3 to 4 cm. long, and dark purplish. The oblong cones are somewhat narrowed toward each end, rounded and often indented at the apex, 9 to 15 cm. long, slightly hairy, and dark purple; the fan-shaped scales are 3 to 3.5 cm wide, not quite as long; the bracts, which are scarcely half the length of the scales, are reddish, obovate, slightly toothed toward the slender-tipped apex. The yellowish brown seed, about 12 mm. long, is scarcely half the length of the shining yellowish, obliquely wedge-shaped wing.

The wood is rather hard, of medium strength, close-grained, pale brown; its specific gravity is about 0.42. It is sparingly used in carpentry in its native region under the name of "larch."

This magnificent fir has unfortunately not taken kindly to cultivation either in America or Europe, so that it will probably never exhibit that grandeur in our parks which it shows in its native mountains.

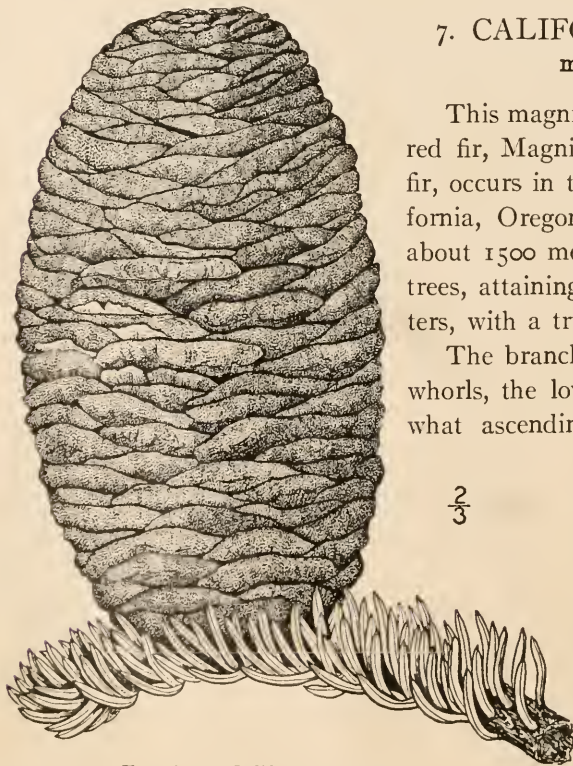


FIG. 63. — California Red Fir.

7. CALIFORNIA RED FIR — *Abies magnifica* A. Murray

This magnificent tree, also called the Great red fir, Magnificent fir, Red fir, and Red bark fir, occurs in the mountains of northern California, Oregon and Nevada, at elevations of about 1500 meters. It is one of the largest fir trees, attaining a maximum height of 90 meters, with a trunk diameter of 3.6 meters.

The branches are rather stout, in irregular whorls, the lowest drooping, the upper somewhat ascending; their lateral branchlets are relatively remote; when forest grown it is often devoid of branches for half its height. The bark is 1 to 1.5 dm. thick, deeply furrowed into blunt ridges with red-brown scales; the inner bark is bright red. On young trees or branches the bark is quite thin, smooth, and grayish. The stout twigs are

yellowish green, slightly hairy, becoming smooth, reddish brown, and when older, gray. The winter buds are ovoid, sharp-pointed, 10 mm. long, their scales light brown. The leaves are mostly 4-sided, narrowly linear, rounded or bluntly pointed, 2 to 4 cm. long, pale green, with a bloom the first season, becoming blue-green with age; they vary greatly in size, shape, and position, and are said to persist for ten years. The staminate flowers are cylindric, 12 to 20 mm. long, of a deep purplish color, the pistillate being oblong, 3 to 4 cm. long, and reddish brown. The cones are the largest of the genus, oblong-cylindric, narrowed toward the base and the rounded flat or indented apex, 15 to 25 cm. long, short-hairy, purplish or yellowish; the scales are stalked, about 4 cm. wide and somewhat longer than wide, gradually narrowed to the heart-shaped base; the bracts are one third shorter than the scales, oblong or spatulate, sharp tipped, slightly toothed above the middle. The seed is dark brown, 15 to 18 mm. long, with a shining broadly wedge-shaped wing.

The wood is soft, weak, quite durable, reddish brown and shining; its specific gravity is about 0.47. It is much used in California for construction and for fuel.

This tree, truly magnificent at any stage of its long life, thrives in England and France, but it does not do well in the eastern United States.

8. SHASTA FIR — *Abies shastensis* Lemmon

Also called Shasta red fir, this occurs in the mountains of southern Oregon and northern California, especially on Mt. Shasta, where it forms exclusive forests at an altitude of 1800 to 2400 meters. It has been considered by some as a variety of the California red fir, which it resembles in foliage. The cones resemble those of the Noble fir, but it grows at higher altitudes and is smaller, its maximum height being 60 meters, with a trunk diameter of 1.2 meters.

The bark is very rough and almost black. The mostly 4-sided leaves are about 2 cm. long, nearly 2 mm. thick, usually erect, incurved, and light green. The oblong cones are 13 to 15 cm. long, rounded at both ends, and purple, their scales 3.5 cm. wide, about the same length, broadly rounded and revolute at the apex, abruptly contracted just above the middle, also near the base into a long stalk; the bracts are spatulate, irregularly toothed, and abruptly taper-pointed; the tip is almost 10 mm. wide and projects about the same distance beyond the scales, over which it is usually reflexed and of a bright yellow color. The seed is nearly oval, about 15 mm. long; its wing is obliquely obovate in outline, straight on one side, about 25 mm. long and 15 mm. broad.

The wood is soft, not strong, close-grained, reddish brown, its specific gravity about 0.41.

9. NOBLE FIR — *Abies nobilis* Lindley

This tree, also called Red fir, Noble red fir, Feather cone fir, Bracted fir, and erroneously Larch by lumbermen, grows in northern California, Oregon and Washington, where it inhabits mountains at elevations of from 750 to 1500 meters, sometimes forming the bulk of the forest and attaining the height of 90 meters, with a trunk diameter of 3 meters.

The main branches are short, stiff, and rather far apart; the smaller branches are also remote, forming a rather open, conic tree. The bark, which is from 3 to

5 cm. thick, is deeply furrowed into broad ridges, which are broken into closely adherent reddish brown scales; that of younger trees is much thinner, smooth, and paler. The slender twigs are covered with short hairs, light red-brown, gradually becoming smooth and darker with age. The ovoid winter buds are 6 mm. long, resinous, and covered by sharp-pointed brown scales. The leaves are 2.5 to 4 cm. long, light green; those on the lower branches are spreading, somewhat flattened,

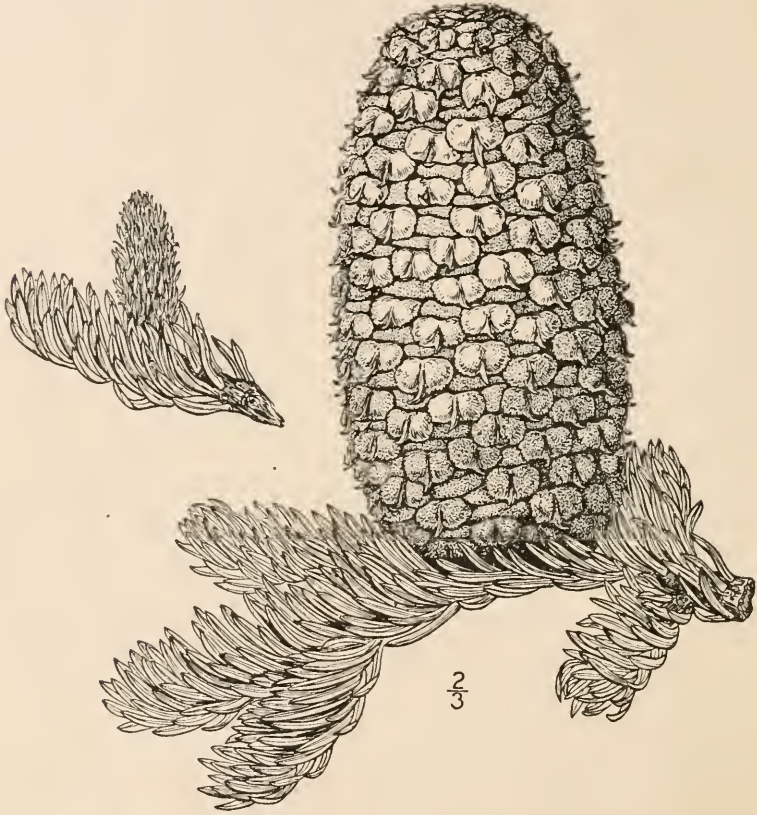


FIG. 64. — Noble Fir.

deeply grooved on the upper surface, keeled beneath, rounded or notched at the apex; those on the upper fertile branches are erect, incurved, and crowded, thick, nearly 4-sided, and sharp-pointed. The staminate flowers are cylindric, 1.5 to 2.5 cm. long, of a reddish or purple color, the pistillate flowers also cylindric, 2.5 to 4 cm. long. The cones are cylindric-oblong, somewhat narrowed at the base and the apex, 10 to 15 cm. long, finely hairy, purplish or brown and characterized by the projecting recurved tips of the bracts; the fan-shaped scales are about 3.5 cm. wide, and about as long; the papery bracts about 4 cm. long, with fringed margins and long tapering point, project beyond and are reflexed over the cone-scales so as to almost cover them. The brown seed, about 1 cm. long, is provided with a very broad wing.

The wood is hard, strong, rather close-grained and light brown; its specific gravity is about 0.45. It is sometimes sawed into lumber, and under the name of "larch" is used to a small extent in construction and for boxes.

This tree grows well in England, producing its cones in great abundance; it also sometimes thrives in the middle Atlantic States, but is not hardy northward.

10. BRISTLE CONE FIR — *Abies venusta* (Douglas) Koch

Pinus venusta Douglas. *Pinus bracteata* D. Don. *Abies bracteata* Nuttall

This, the most peculiar, as well as the rarest of the North American Fir trees, is also called Santa Lucia fir, Silver fir, and Fringed spruce. It seems to be restricted to Monterey county, California, where it occurs but sparingly on the rocky slopes and in cañons of the Santa Lucia Mountains at elevations of 450 to 1500 meters, attaining a maximum height of 45 meters, with a trunk diameter of 9 dm.

The branches are rather stout, far apart, and somewhat drooping, their branchlets crooked and rather remote, forming an open conic tree contracted above into a narrow head, unlike any others of its genus. The bark is irregularly fissured and broken into closely adhering scales of a red-brown color and often marked by the remains of old resin "blisters," which are quite abundant on the thinner younger bark. The stout twigs are smooth, light red-brown, and covered with a bloom. The ovoid winter buds are 2.5 cm. long, 5 to 8 mm. thick, sharp-pointed, and loosely covered by large pale-brown papery scales, the innermost ones persisting for some time at the base of the newly formed twig. The stiff leaves, which usually spread outwardly, are flat, linear, narrowed above, 4 to 6 cm. long, 2.5 to 3 mm. wide, long taper-pointed, narrowed to a disk-like base, marked by a central groove, yellowish green and shining on the upper side, silvery white beneath; those on older fertile branchlets have strongly recurved margins; on falling they leave an oval scar

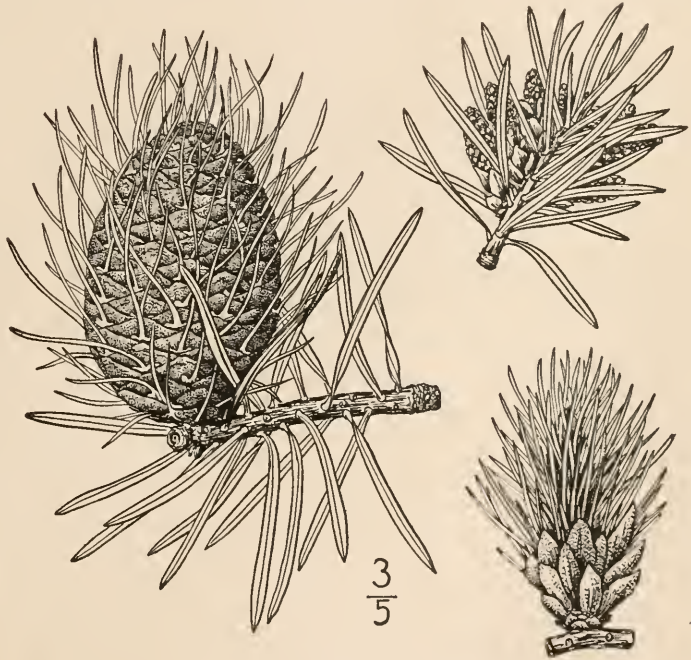


FIG. 65. — Bristle Cone Fir.

on the twig. The flowers appear in May. The staminate flowers are cylindric, 2 to 3 cm. long, yellowish to red. The pistillate flowers are oblong-cylindric, 3 to 4 cm. long, and yellowish green. The cones, which are borne on stout scaly stalks about 10 mm. high, are ovoid to ovoid-cylindric, 8 to 10 cm. long, blunt at the apex, smooth, and purplish brown; their scales are about 2 cm. wide, and nearly as long, irregularly eroded, rounded or bluntly pointed at the apex, rounded on the sides to a heart-shaped base and stalked; the body of the yellowish bract is somewhat shorter than the scale, inverted spear-shaped, terminated by a long flat stiff tip 3 to 4 cm. long, erect and closely pressed to the cone in its upper half, but more or less reflexed in the lower portion. The brown oblong seed, 10 mm. long, is almost as long as its thin shining red-brown obovate wing.

The wood is of medium hardness, coarse-grained, light yellow-brown; its specific gravity is about 0.67. It is not an article of commerce.

The cultivation of this most beautiful and curious fir tree has not succeeded in the eastern United States, but it is said to do well in Europe.

VII. THE SEQUOIAS

GENUS **SEQUOIA** ENDLICHER



T present this genus is represented by two living species of gigantic evergreen trees, confined to California and southern Oregon, although fossils referred to the genus have been found within the Arctic circle, in Europe, and over much of North America.

The resinous leaves are linear and spreading or with some appressed ones on some twigs, or both kinds on the same twig, in the one species; ovate, ovate-lanceolate and appressed to the twigs, or their tips spreading, in the other. The flowers are monœcious, very small and solitary, appearing in early spring or late winter from buds the previous season. The staminate flowers are terminal, or in the axils the upper leaves, ovoid or oblong, stalked, their stalks bearing many overlapping scale-like bracts; the stamens are arranged around a short axis, their filaments short, the connective ovate and sharply pointed, with 2 to 5 globular anthers on its inner surface. The pistillate flowers are terminal, oblong, consisting of many spirally arranged ovate, keeled, sharp-pointed scales, under which are 5 to 7 ovules. The cones are ovoid or broadly oblong, drooping, ripening and shedding the seed the first or second season, but persisting on the tree for some time; the scales are hard and woody, contracted or stalk-like at the base, enlarged transversely at the apex, which is depressed in the middle and often provided with a short central tip; the seeds are 5 to 7 under each scale, oblong or ovoid, compressed, broadly thin-winged; embryo straight; endosperm fleshy; cotyledons 4 to 6.

The name is in commemoration of Sequoyah, a talented half-breed Cherokee Indian, also called George Guess (1770-1843), who devised the first Indian (Cherokee) alphabet, the Redwood, *Sequoia sempervirens* (Lambert) Endlicher, being the type of the genus:

Leaves awl-shaped and appressed; cones 5 to 8 cm. long.
 Leaves mostly flat and spreading; cones 2.5 to 4 cm. long.

1. *S. Washingtoniana*.
2. *S. sempervirens*.

1. BIG TREE — *Sequoia Washingtoniana* (Winslow) Sudworth

Taxodium Washingtonianum Winslow. *Wellingtonia gigantea* Lindley

Sequoia gigantea Decaisne, not Endlicher. *Sequoia Wellingtonia* Seemann

This enormous tree is also called *Sequoia*, Giant sequoia, and Mammoth tree, and is noteworthy for its size, massive trunk, and great age. It is confined to a narrow belt about 250 miles long, along the western slope of the Sierra Nevada Mountains in California, at altitudes of from 1500 to 2500 meters, its northern limit



FIG. 66. — Big Tree.

being in Placer county, where only a few old trees occur; southward, to Tulare county, however, trees of all ages and sizes occur, from seedlings up to the ancient monarch 5000 years old and nearly 100 meters tall, with a trunk over 10 meters in diameter.

The trunk is swollen and often buttressed at the base, above which it is considerably ridged and gradually tapering. The branches of young trees are crowded from the ground up, slender and pendulous below; toward the top they are more upright, forming a stiff, narrow conic tree. On very large, old trees the branches have disappeared for 30 meters or more, above which they are irregular and more or less contorted, forming a rounded, often picturesque head. The bark of old trees is frequently 6 dm. thick, divided into broad plates often 1.5 m. wide, the sur-

face covered with loose fibrous scales, light brownish red, often purplish on the outer surface; the bark of younger trees is very much thinner. The twigs are stout, pendulous, the lateral ones much branched and flattened, densely clustered; they are dark bluish green; after the leaves fall they become somewhat scaly and brownish red or purplish. The leaves are lanceolate or ovate, 3 to 6 mm. long, appressed-decurrent at the base, spreading at the sharp-pointed apex, concave within, convex and ridged on the outer side; on vigorous shoots they are more awl-shaped, and often 12 mm. long. The staminate flowers are numerous and cover the entire surroundings with their profuse yellowish pollen; they are about 6 mm. long, and composed of 20 to 25 stamens. The pistillate flowers are oblong, about 8 mm. long, consisting of 25 to 40 yellow keeled scales, each bearing 3 to 7 ovules. The cone is broadly oblong, 5 to 8 cm. long, 3.5 to 6 cm. wide, reddish brown, opening but little and changing very little in shape after shedding the seed; the scales, 15 to 20 mm. long, are quite thick and woody, somewhat expanded at the apex, deeply impressed and often provided with a minute reflexed bristle. Seeds 3 to 7 under each scale, linear-lanceolate, 3 to 6 mm. long, flattened, light brown, and surrounded by wings slightly broader than the body and notched at the apex.

The wood is soft, weak and brittle, coarse-grained and bright red; its specific gravity is about 0.29. It is very durable, and is made into boards, shingles, and fencing.

It is frequently cultivated in Europe, but while it grows very rapidly for a time, it gives no promise of ever attaining the great size and age for which it is famous in its home. In the eastern United States it is very unsatisfactory in cultivation, climatic conditions being unsuited to its growth.

2. REDWOOD — *Sequoia sempervirens* (Lambert) Endlicher

Taxodium sempervirens Lambert. *Sequoia gigantea* Endlicher

This gigantic tree is also called Sequoia, Coast redwood, and California redwood, and occurs only in the coast region from southwestern Oregon to San Luis Obispo county, California, probably never more than 25 miles from the coast and not at greater elevations than about 1000 meters. Its maximum height is about 105 meters, with a trunk diameter of over 8 meters.

The trunk is much buttressed and swollen at the base, tapering upward, somewhat fluted, and usually devoid of branches for 20 meters or more. The branches of younger trees are slender, curved downward below, but erect toward the top, forming a slender open cone. The lower branches disappear before the tree reaches full size, and the upper ones become stouter, forming a small irregular compact head very much out of proportion to the tree's general massiveness. The bark is 1.5 to 3 dm. thick, the ridges often 6 to 9 dm. broad; it separates on the surface into elongated narrow fibrous strips of a dark brown color, and often is broken crosswise, exposing the lighter brownish red inner layers. The twigs are slender,

widely spreading, light green, soon becoming dark green, and after the leaves have fallen, brownish red and covered with thin scaly paper-like bark. The buds are about 3 mm. long, and scaly. The leaves are linear, 6 to 20 mm. long, somewhat curved, 2-ranked, spreading at wide angles to the twigs by a twist of the base, sharply stiff-pointed, decurrent at the tapering base, somewhat revolute on the margin, dark green and shining above, glaucous, and with a prominent midrib beneath; on young twigs they are often many-ranked and appressed or ascending, somewhat scale-like, often only about 6 mm. long. The staminate flowers are ovoid, 3.5 mm. long, blunt, short-stalked, composed of about 12 stamens, their connectives ovate, blunt or pointed; the pistillate flowers are oblong, about 8 mm. long, consisting of 15 to 25 ovate-orbicular, curved, and pointed scales concealing about 6 ovules. The cones are oblong, 2.5 to 4 cm. long, reddish brown, their scales opening widely when shedding the seed, about 20 in number, obpyramidal, enlarged above into an oblong disk 3 by 8 mm. across, grooved, with no bristle-like tip; seeds 3 to 5 under each scale, oblong-lanceolate, about 1.5 mm. long, light brown, the wings about as broad as the body.



FIG. 67. — Redwood.

The wood is soft, brittle, rather weak, close-grained, and light red; its specific gravity is about 0.42. It is easy to split and work, takes a fine polish, and is largely sawed into lumber for general purposes and used in the eastern United States as well as all over the West, and much exported; also made into shingles, veneering, telegraph poles, railroad ties, tanks, and barrels. The bark is used to stuff furniture, and for articles such as pin cushions, and the burl turned into dishes.

Although largely lumbered this tree rapidly renews itself by the numerous vigorous sprouts that spring up from the stumps, and there appears to be no immediate danger of its extermination, though it is very desirable that large areas should be preserved for the public use.

This, one of the most magnificent North American coniferous trees, will not

exhibit its beauty in cultivation in the eastern States, as it does not thrive when grown out of its fog-laden native region; it grows to great perfection in Europe.

VIII. THE BALD CYPRESSES

GENUS **TAXODIUM** L. C. RICHARD



ONLY 3 species are known, somewhat resinous, deciduous-leaved trees of temperate and warm regions, now confined to the eastern United States and Mexico, but represented by fossil forms in the arctic regions of Europe and North America.

They have alternate, spirally arranged leaves, which often appear as if 2-ranked. All the leaves and some of the lateral twigs are deciduous in the autumn. The leaf-buds are minute, scaly. The flowers are monœcious, opening in the spring before the leaves appear, from buds formed the previous autumn, or sometimes they open in the autumn. The staminate, which are very profusely borne in terminal, long, pendulous panicked spikes, are globose, subtended by numerous imbricated scales, above which the stamens are raised on a short stalk; the filaments are very short, the large yellow connectives broadly ovate, and on them several globose anther-cells are borne. The pistillate flowers are in small terminal clusters, borne near the ends of the twigs of the previous season, sub-globose, composed of crowded, thick ovate scales, each concealing 2 ovules. The fruit is a globose or short-oblong cone, ripening the first season, but persisting for a short time after shedding the seed, composed of several short-stalked, thick, woody, shield-like scales, each with a triangular scar; seeds 2 under each scale, erect, sharply but unequally triangular, leathery, shining, and irregularly 3-winged; cotyledons 6 to 9.

These trees have the peculiarity of forming upright projections from the roots when growing in water; these are called cypress knees. The name is Greek, in allusion to the yew-like leaves of the type species, *T. distichum* (L.) L. C. Richard.

One species, *Taxodium mucronatum* Tenore, the Mexican Bald Cypress, occurs in northeastern Mexico near our southern boundary.

Leaves 2-ranked, widely spreading; twigs elongated; bark thin, rather smooth.

1. *T. distichum*.

Leaves closely appressed; twigs appressed, bark thick, deeply furrowed.

2. *T. ascendens*.

1. BALD CYPRESS — **Taxodium distichum** (Linnæus) L. C. Richard

Cupressus disticha Linnæus

This large tree of our southern States is also called Black cypress, Red cypress, White cypress, and Deciduous cypress. It is confined to the coastal region from southern Delaware to Florida, westward, near the Gulf, to Texas, and up the Mississippi valley to Missouri and Indiana, often forming great forests in swamps

and along rivers and streams. Its maximum height is about 50 meters, with a trunk diameter of 4 m. above the enlarged, often hollow, base.

The trunk is prominently fluted below and tapers to the top; the bark is about 2.5 cm. thick, rather smooth and brownish red. The branches are short, rather slender, widely spreading and forked, forming a conic tree; the lower branches disappear from old trees, or some become elongated and drooping or wide-spreading, forming a grotesque, irregular head often 30 meters across, or in the crowded forest the top is exceedingly narrow. The twigs are slender, pale green, becoming light reddish brown and somewhat shining, and finally darker and covered with scaly bark. The leaves are thin and flat, mostly 2-ranked, linear, 1 to 2 cm. long, often curved, sharp-pointed, sessile, light yellowish green on both sides or slightly whitish beneath; they turn brown in the fall and, with the lateral twigs, fall off. The staminate flowers are in drooping panicles 1 to 1.5 dm. long, 1 to 2 mm. in diameter and purplish. The pistillate flowers in the axils of the leaves, are globose, 3 mm. in diameter. The cones, usually in pairs at the ends of the branches, are globose, about 2.5 cm. in diameter, wrinkled, the scales closely fitting together by their edges. The seed is 8 to 10 mm. long.

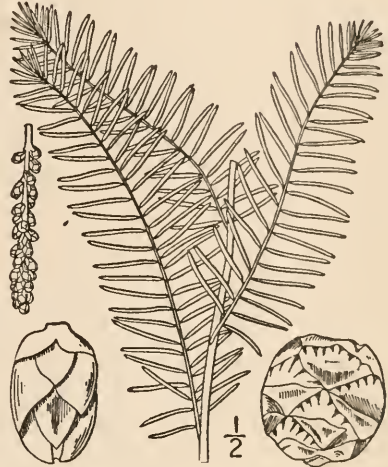


FIG. 68. — Bald Cypress.

The wood is soft, rather weak, close, and straight-grained, variable in color from light to dark brown; its specific gravity is about 0.45. It is very durable and easy to work, being largely used in general carpentry, and is the most desirable wood for greenhouse or conservatory construction. Lumbermen recognize a "white" and "black" cypress lumber; the latter is said to be the most durable and hardest; it is taken from the base of the tree. A resin obtained, especially from the cones, is used in the South as a healing application to wounds.

This tree has been in cultivation for a long time, especially in Europe, where specimens reputed to be 150 years old occur. It is hardy as far north as Massachusetts, but is not seen in cultivation as often as it deserves to be.

2. POND CYPRESS — *Taxodium ascendens* Brongniart

Cupressus disticha imbricaria Nuttall. *Glyptostrobus pendulus* Endlicher

Taxodium imbricatum (Nuttall) Harper

This tree, which is considered by some to be only a variety of the former species, is rather smaller. Its enlarged base is more conic, and it grows mostly in ponds in the pine lands from Dismal swamp, Virginia, to Florida and Alabama, usually over clay. Its maximum height is 25 meters, with a trunk diameter of 1 m.

The trunk is enlarged at the base to two or three times its normal diameter,

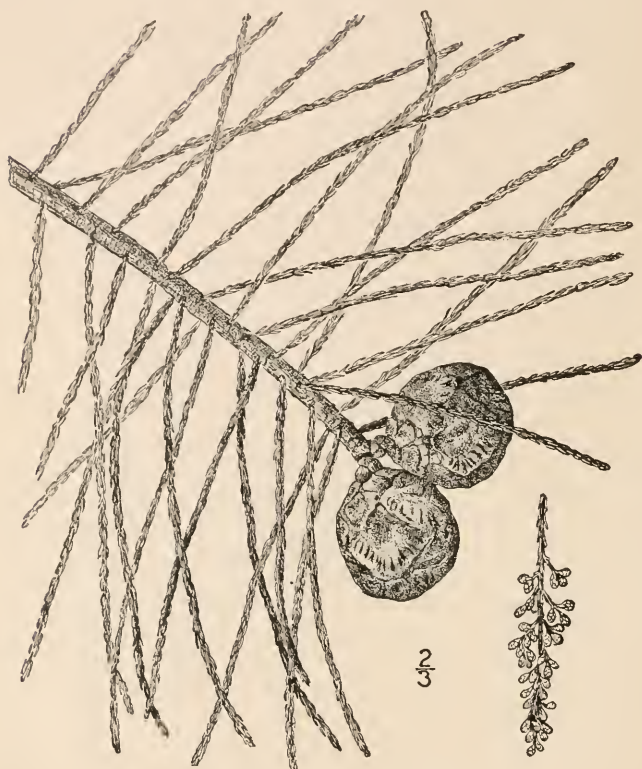


FIG. 69. — Pond Cypress.

above which it is shallowly fluted and tapering. The bark is 5 cm. thick, deeply furrowed into coarse ridges which are somewhat scaly, fibrous, and light brown. The twigs are slender, usually nearly erect, light green, becoming reddish brown and shining; the lateral twigs are often 15 to 18 cm. long. The leaves are closely appressed, awl-shaped, 5 to 10 mm. long, long-pointed, keeled above, concave beneath, somewhat spreading at the apex. The flowers and fruit are very similar to those of the foregoing species.

The wood of the Pond cypress is said to be heavier and stronger than

that of the Bald cypress. It has been in cultivation for many years, especially in Europe, where it has passed as a native of Asia under the name of *Glyptostrobus pendulus* Endlicher.

Young shoots from the base of the tree often bear the linear spreading leaves of *Taxodium distichum*, indicating their ancestral affinity.

IX. INCENSE CEDAR

GENUS **HEYDERIA** K. KOCH

SPECIES **Heyderia decurrens** (TORREY) K. KOCH

Libocedrus decurrens Torrey



MAGNIFICENT evergreen tree occurring in a variety of soils and situations, from Oregon southward through California, east into Nevada, and beyond our area into Lower California, usually at altitudes of from 900 to 1800 meters. It attains a maximum height of 45 meters, with a trunk diameter of 2.4 m.

The trunk is tall and straight, broadly and irregularly lobed at the base, from which it gradually tapers. The branches are slender, somewhat pendulous below, but erect toward the top, forming a narrow, open head. Very old trees are more or less irregularly outlined, owing to the abnormal development of some of the branches. The bark is about 2 cm. thick, irregularly furrowed into close, scaly ridges of a bright red-brown color. The twigs are rather stout, somewhat flattened, yellowish green, soon becoming round, brown, or purplish brown, and marked with circular scars; the lateral twigs are flattened, and fall off after two or three years. The leaves are in whorls of 4, scale-like, oblong or obovate, decurrent, and closely joined to the twigs except at the thickened sharp-pointed apex; the lateral ones are glandular and keeled, the inner are much compressed and almost covered by the lateral; on the leading twigs they are about 1 cm. long, those on the smaller twigs only about one third as long. The flowers, appearing about the end of January, are monœcious, the two kinds occurring at the tips of short, lateral twigs, but on different branchlets, the staminate in great profusion, often giving the tree a golden aspect; they are nearly sessile, ovoid, 5 mm. long, consisting of 12 to 15 stamens with



FIG. 70. — Incense Cedar.

short, stout filaments and broad yellow connectives. The pistillate flowers are subglobose to oblong, about 3 mm. long, subtended by several pairs of broadly ovate acute scales, which remain at the base of the fruit, which ripens and drops its seed in the autumn of the same season but persists until the next spring. The cones are drooping, oblong, 18 to 25 mm. long, somewhat oblique at the base, light reddish brown, composed of 3 pairs of opposite scales, the lower ovate, acute, recurved, and about one third the length of the entire cone; the second or inner scales are ovate-oblong, woody, slightly convex, nearly as long as the entire cone and about 8 mm. wide, spreading from the flat, woody axis formed by the fusion of the upper scales. The seeds, of which there are 2 under each of the middle scales, are oblong-lanceolate, 8 to 12 mm. long, with membranaceous, light brown, oblique wings; there are only 2 cotyledons and the endosperm is fleshy.

The wood of the Incense cedar is soft, weak, close-grained, and light reddish

brown; its specific gravity is about 0.40. It is very durable and is used for fencing, general carpentry, furniture, laths, and shingles.

The genus is composed of this species and one of China. It is named in honor of Edward Heyder, a German botanist and horticulturist. This tree is also called Bastard cedar, California post cedar, White cedar, Red cedar, Cedar, Post cedar, and Juniper. The genus *Libocedrus*, to which it has been referred, is Chilean and Australasian.

X. THE ARBOR-VITÆ

GENUS **THUJA** [TOURNEFORT] LINNÆUS



THIS genus includes 4 known species of aromatic slightly resinous evergreen trees or shrubs of northern North America and northeastern Asia, and is represented in Greenland and Europe by several fossil forms. The wood is of considerable value as furnishing very desirable lumber and the bark is valued as a tanning material. The leaves and twigs possess stimulant properties, due in part to a volatile oil. But they are best known as ornamental trees.

They have opposite, scale-like, imbricated leaves, which are 4-ranked, sharp-pointed, and awl-shaped on the larger twigs, blunt on the younger, more or less keeled on the back. The flowers are monœcious, appearing in early spring, small and solitary, terminal, from buds formed the previous season, the two kinds usually on different twigs. The staminate flowers are ovoid or globose, 4 to 6 mm. long, the stamens alternately opposite, their filaments short, with peltate connectives, the anthers 2-valved, opening lengthwise. The pistillate flowers are ovoid or oblong, composed of 8 to 12 opposite scales bearing 2 ovules or rarely more. The fruit is a small cone which ripens the first autumn; it is erect or nearly so, ovoid to oblong, pale brown; the few scales are thin, not shining, slightly thickened near the apex; the middle ones are the largest and are fertile, bearing 2 seeds or rarely more, which are erect, more or less woody, oblong, flattened, sharp-pointed, light brown with lighter colored broad lateral wings, not joined at the apex, but blunt-pointed.

The name is the ancient one for some evergreen tree; *Thuja occidentalis* is the type species:

Eastern tree; wood yellow-brown; cone-scales minutely tipped.

1. *T. occidentalis*.

Western tree; wood reddish-brown; cone-scales bristle-tipped.

2. *T. plicata*.

1. AMERICAN ARBOR-VITÆ — **Thuja occidentalis** Linnæus

The American arbor-vitæ, or White Cedar, as it is also called, is a moisture-loving tree, occurring in swamps and low, wet forests to the exclusion of other trees, also along rocky streams, from New Brunswick to Manitoba, southward to New Jersey and Minnesota, extending, in the Alleghanies, to North Carolina and

Tennessee. Its maximum height is 22 meters, with a trunk diameter of 1.6 meters. Sometimes, however, it is only a shrub.

The trunk is often fluted and much buttressed at the base, and frequently divided into several smaller upright trunks. The branches are horizontal, short, more or less curved upward toward the ends, forming a dense, narrow, cone-shaped tree. The bark is about 6 mm. thick, shallowly fissured into long, narrow ridges, which peel off into long fibrous persistent shreds of a light yellowish or reddish brown color. The twigs are flattened, somewhat 4-sided, sometimes zig-zag, light yellowish green, changing to light reddish brown, and finally darker brown, and become round and marked by the scars of the fallen lateral twigs, which are pendulous and fall away after having become about 1 dm. long. The leaves are yellowish green, scale-like, ovate to lanceolate, 6 mm. long, sharply pointed at the apex, and glandular on the back, on the larger twigs; on the lateral twigs they are much smaller, scarcely glandular, the lateral rows much keeled, the others flattened, giving the twigs a very flat appearance. The flowers, appearing from April to June, are about 1.5 mm. long, and pinkish. The cones ripen in the autumn, and shed their seed, but persist during the winter; they are oblong, 8 to 12 mm. long. The scales are leathery, oblong, blunt-pointed, or minutely tipped, the inner having 2 seeds, the outer often but 1 seed or none. The seeds are oblong, about 6 mm. long; their wings about as wide as the body, appearing notched at the apex.

The wood is soft, brittle, rather coarse-grained, light yellowish brown, and fragrant; its specific gravity is about 0.32. It is very durable, and is largely used at the North for railroad ties, fence-posts, and shingles. The sapwood is easily separated into thin strips, which are used by the Indians in their basketry, and is also made into brooms; preparations of the green twigs are used in medicine.

As an ornamental plant it is well known in northern North America and in Europe, especially used for hedges and cemetery ornamentation, and having been long in cultivation, a great many forms have been developed that are now known under many different names.

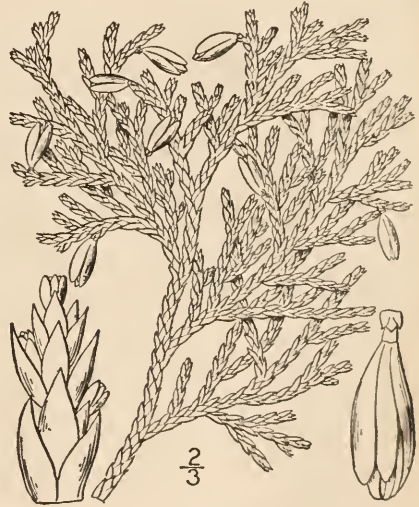


FIG. 71. — American Arbor-Vitæ.

2. CANOE CEDAR — *Thuja plicata* D. Don*Thuja gigantea* Nuttall

A noble tree of the moist bottom lands or stream-banks of the Northwest, where it grows in small groves or as individual specimens, not forming extensive forests by itself. Sometimes on dryish mountain sides, where it ascends to an altitude of 1800 meters, it is reduced to a shrub. It is known from Alaska to central California, eastward to the western slope of the Rocky Mountains of Idaho and Montana. Its maximum height is 75 meters, with a trunk diameter of 1.8 m. above the broad buttressed base.

The trunk is tall, straight, and slender, with immense buttresses sometimes 5 m. across, above which it tapers gradually. The branches are mostly short, horizontal, with drooping ends, often clothing the trunk from base to apex, forming a dense, narrowly conic tree. The bark is 12 to 18 mm. thick, irregularly and shallowly fissured into broad, rounded ridges, and separates into long, narrow, fibrous shreds of a bright brownish red color. The twigs are 4-sided, much



FIG. 72. — Canoe Cedar.

flattened, sometimes zigzag, light yellowish green at first, becoming reddish brown, and finally often purplish and shining. Most of the lateral twigs fall off after becoming two or three years old. The leaves are bright green and shining, ovate, about 6 mm. long, long-pointed, and glandular on the back, those on the lateral twigs half as long, ovate, short-pointed, and scarcely glandular. The flowers are brownish and about 2 mm. long. The cones, which ripen in early autumn, are near the ends of the branches, in small clusters, 12 to 18 mm. long; their scales are leathery, thick-tipped, often with a stout, short bristle. The seeds are borne

under several of the central scales, 2 or sometimes 3 under each; they are about 6 mm. long; their wings project beyond the apex of the seed, and are divergent at the apex.

The wood of the Canoe cedar is soft, rather weak, brittle, and coarse-grained, red-brown, with a specific gravity of about 0.38. It is very durable, and is used for general building purposes, fence-posts, furniture, in cooperage, and for telegraph poles. The northwestern Indians used it for their dug-out canoes and totem poles; they also make the inner bark into ropes, blankets, and thatch. As

an ornament it is well known in Europe and in the eastern States. A dwarf form is also known in cultivation. It is also called Pacific arbor-vitæ, Arbor-vitæ, Lobb's Arbor-vitæ, Pacific red cedar, Red cedar, Gigantic red cedar, Gigantic cedar, Western cedar, and Shinglewood.

XI. THE CYPRESSES

GENUS **CUPRESSUS** [TOURNEFORT] LINNÆUS



CUPRESSUS comprises about 12 species of scaly-leaved evergreen trees or shrubs with naked buds, natives of western North America, Mexico, southern Europe, and Asia.

They have opposite, paired leaves, taper-pointed, blunt or rarely rounded at the apex, the tips spreading or appressed; they are rounded and sometimes glandular on the back, turn brown and become thick before falling; on vigorous twigs and young plants they are longer, narrower, and sometimes spreading. Their monœcious flowers are borne at the ends of the twigs, the two kinds being on different branchlets; the staminate flowers are generally oblong, composed of many yellow opposite stamens, their filaments short, the connectives mostly broader than long, anther-cells 2 to 6, nearly globular; the pistillate flowers are ovoid to nearly globular, with 5 to 10 opposite scales bearing many ovules. Cones globose, ripening and shedding the seed the second year, after which they remain on the branches for some time; they are composed of a few thickened scales which are abruptly enlarged and flattened at the apex, with a thickened pyramidal projection; the seeds are numerous, erect, borne under the cone scales; they are thick, sharply angular, somewhat flattened, their wings thin; cotyledons 2 to 4.

These trees are very resinous, and some species furnish close, durable, fragrant woods. As ornamental trees or shrubs they are frequently planted, especially, in warm regions; the old world Cypress, *Cupressus sempervirens* Linnæus, is the type of the genus. The generic name is Greek.

In our area they are confined to the states of California and Arizona. One species occurs in Lower California and two or three others in Mexico.

Leaves dark green, not glaucous, or but slightly so.

Leaves glandless or but obscurely glandular.

Fruit 2.5 to 3.5 cm long.

Fruit 1.5 to 2 cm. long.

Twigs slender; seed light brown.

Twigs stout; seed black.

Leaves with a distinct gland on the back.

Leaves pale, glaucous, not glandular or obscurely so.

1. *C. macrocarpa*.

2. *C. Goveniana*

3. *C. pygmæa*.

4. *C. Macnabiana*.

5. *C. arizonica*.

I. MONTEREY CYPRESS — *Cupressus macrocarpa* Hartweg*Cupressus Hartwegi* Carrière

This very local tree is confined to a narrow strip of coast land, only several miles long, near Monterey bay, California, where it thrives under the most severe exposure and attains a maximum height of 21 meters, with a trunk diameter of about 2 meters.

The trunk is short. The branches of young trees are slender and quite erect, forming a compact conic tree; on old trees they are often much contorted, forming broad, picturesque, flat-topped heads. The bark is 18 to 25 mm. thick, irregularly divided into more or less connected broad and low ridges, which



FIG. 73. — Monterey Cypress.

readily split up into close long narrow scales. The younger bark is dark reddish brown, but on old trunks it is grayish white. The twigs are stout, becoming reddish brown and scaly after the leaves fall from them. The leaves are dark green, broadly ovate, 2 mm. long, closely appressed, or somewhat spreading at the pointed apex, thickened, slightly glandular-pitted and longitudinally furrowed on the back; on young, spreading twigs they are needle-shaped, stiff, about 10 mm. long. The flowers, opening in February or March, are very numerous and yellow, the staminate oblong, 4-sided, 3 mm. long, composed of 6 to 8 stamens, the connective nearly round, with 4 to 6 pollen sacs. The pistillate flowers are oblong, 3 mm. long, their scales sharp and spreading. The

cones are in clusters, short-stalked, nearly globular or a little longer than thick, 2.5 to 3.5 cm. long, light brown, composed of 8 to 12 scales with short thick central projections; seeds crowded under the fertile scales, each of which bears about 20; they are angular, bright brown, about 3 mm. long.

The wood is hard and strong, but rather brittle, close-grained, light brown, or yellowish brown, with a satiny luster; its specific gravity is about 0.63. It takes a fine polish and is very durable.

This tree is much planted, for ornament, in the West, stands clipping well, thus making a very desirable hedge and wind-break; it is also popular in the southern States, and is well known in Europe.

2. GOWEN CYPRESS — *Cupressus Goveniana* Gordon

This handsome tree occurs sparingly in western California from Mendocino county southward to San Diego county, often reaching an altitude of 900 meters in mountain cañons. It is very variable, from a vigorous tree 15 meters high, with a trunk diameter of 6 dm., to a small shrub. It is also called Mountain cypress and North coast cypress.

The trunk is short and much branched. The branches are slender, the lower spreading, forming an open head. The bark is 6 to 12 mm. thick, irregularly broken into nearly flat, low ridges, which split up into persistent oblong, dark reddish brown scales; the inner bark is much lighter in color. The twigs are slender, smooth, orange brown, becoming reddish brown or often purplish, but finally grayish. The leaves are dark green, ovate, 1.5 to 3 mm. long, sharp or rounded, closely appressed, faintly glandular pitted or glandless. On young, vigorous plants or on strong shoots the leaves are more spreading, needle-like, and twice as long. The flowers, which open in early spring, are yellow, the staminate oblong, 4-sided, 3 or 4 mm. long, composed of 6 to 8 stamens, their connectives peltate and somewhat broader than long; the pistillate flowers are 3 mm. long, their scales sharp-pointed and somewhat spreading. The cones are nearly globular or short-oblong, 1.5 to 2 cm. in diameter, reddish brown or purplish, and shining, composed of 6 to 8 scales with blunt or sometimes sharp-pointed low and broad central projections. The seeds, usually about 20 on each fertile scale, are light brown and shining, irregularly 4-angled, and about 3 mm. long.

The wood is soft, brittle, and weak, close-grained and light brown; its specific gravity is about 0.47.

It is seldom cultivated in America, but in Europe is known in several garden forms.

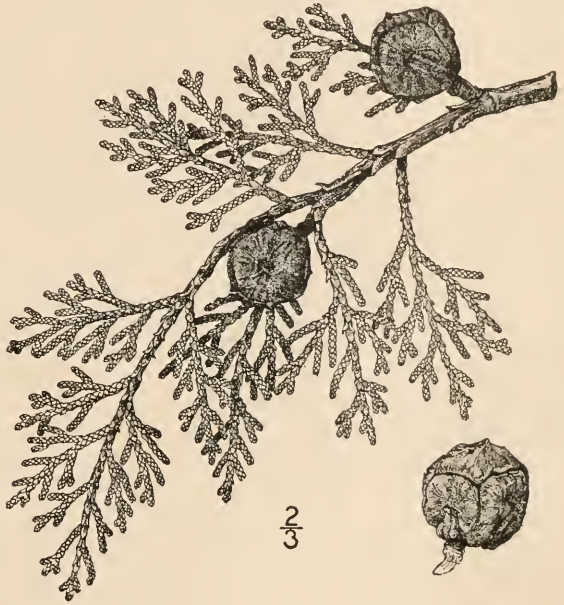


FIG. 74. — Gowen Cypress.

3. MENDOCINO CYPRESS — *Cupressus pygmaea* (Lemmon) Sargent*Cupressus Goveniana pygmaea* Lemmon

This very local tree is known only in a small sandy, fire-swept barren near the coast of Mendocino county, California, where it occurs in very crowded thickets as a shrub, fruiting when scarcely 1 meter tall, but in protected places and the margins of ravines it becomes a tree 9 meters high, with a trunk diameter of 3 dm.

The trunk is short; the branches are rather stout and upright. The bark is about 6 mm. thick, shallowly fissured into flat ridges, separating on the surface into long, narrow scales. The twigs are ascending, comparatively stout, bright reddish brown, becoming purplish, and finally reddish brown. The leaves are dark green, ovate, sharp-pointed, 1.5 to 3 mm. long, appressed, spreading at the sharp-pointed apex, thickened and without glands on the back; on young or vigorous twigs they are taper-pointed. The staminate flowers are slightly 4-angled, the stamens with broad peltate connectives. The pistillate flowers are composed of 6 to 10 spreading ovate-oblong scales. The cone is usually sessile, globose-oblong, 12 to 20 mm. long, dull grayish brown, composed of 6 to 10 scales, their nearly flat tops with a small projection; seeds black, compressed, about 3 mm. long.



FIG. 75. — Mendocino Cypress.

The wood is soft, coarse-grained, and brown.

4. MACNAB CYPRESS — *Cupressus Macnabiana* A. Murray*Cupressus Nabiana* Masters

This, one of the most local California trees, is known only from dry hills and mountain slopes in the northern part of that state. Its maximum height is 9 meters, with a trunk diameter of 4 dm.; often, however, it is a many stemmed shrub, about 3 meters tall.

The trunk is short, the branches more or less crooked, forming an irregular tree. The bark is thin and somewhat regularly broken into broad, flat, connected ridges of a dark reddish brown color, the surface separating into long, thin, persistent scales. The twigs are slender, smooth, light purplish red, becoming dark brown. The leaves are dark green, ovate, about 1.5 mm. long, tightly appressed, rounded or sharp-pointed at the apex, convex and glandular on the back: on vig-

orous twigs they are long-pointed and more spreading. The flowers open in the early spring; the staminate are oblong-cylindric, blunt, and about 2.5 mm. long, composed of about 12 stamens, their connectives broader than long, and peltate. The pistillate flowers are nearly globular, 1.5 mm. long, their scales ovate. The cones are short-oblong or nearly globular, 18 to 25 mm. long, nearly sessile or short-stalked, dark brown, usually somewhat glaucous, composed of 6 or 8 scales, the lower ones having thin, prominent projections. The seeds are flattened, scarcely 1.5 mm. long, dark brown, narrowly winged.



FIG. 76. — Macnab Cypress.

The wood is soft, close-grained, and brown; its specific gravity is about 0.56. The tree is sparingly cultivated in European gardens; it is also called Fragrant cypress, Shasta cypress, Macnab's cypress, California mountain cypress, White cedar, and Cypress.

5. ARIZONA CYPRESS

Cupressus arizonica Greene

Cupressus guadalupensis Sargent, not
S. Watson

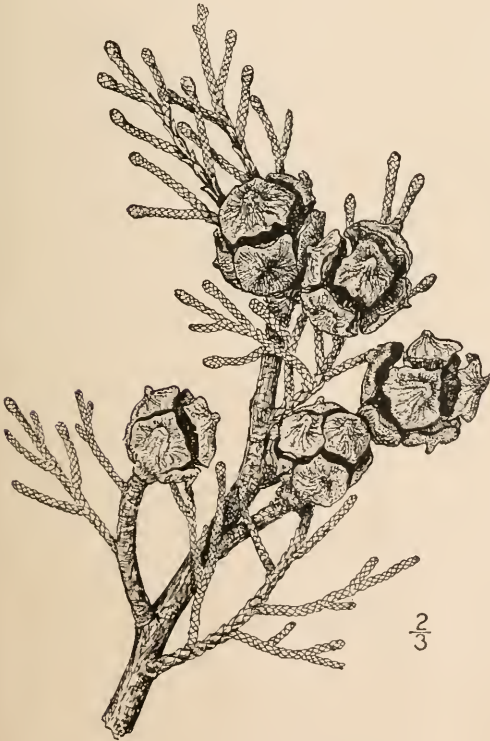


FIG. 77. — Arizona Cypress.

This tree occurs in the mountains of Arizona, and in adjacent Mexico, usually at altitudes of from 1500 to 2400 meters. Its maximum height is about 21 meters, with a trunk diameter of 1.2 meters. It is also called Red-barked cypress, and Arizona red-barked cypress, and is readily distinguishable from the other American cypresses by its pale green foliage.

The branches are horizontal, forming narrowly conic or sometimes broad heads. The old bark is thin, dark red or brown, separating into long shreds

which persist for many years; that of younger stems separates into irregular scales, which expose the bright reddish inner layers on falling. The twigs are stout, becoming smooth, light reddish brown, and somewhat glaucous. The leaves are pale green and glaucous, ovate, about 3 mm. long, tightly appressed, or slightly spreading at the sharp-pointed apex, thickened, and usually without glands, sometimes faintly glandular on the back. The staminate flowers are oblong, about 5 mm. long, blunt at the apex; the 6 or 8 stamens have broad yellow connectives. The stout-stalked cones are subglobose, about 2 cm. long, reddish brown, densely glaucous, composed of 6 to 8 scales tipped with stout, often incurved, projections; the seeds are oblong to nearly triangular, 1.5 to 3 mm. long, brown, narrowly winged.

The wood is soft, close-grained, grayish, with yellow streaks; its specific gravity is about 0.48. It is used locally for fuel and in construction.

Cupressus guadalupensis S. Watson, with which this tree has been confused, inhabits Lower California.

XII. THE GROUND CYPRESSES

CHAMÆCYPARIS SPACH



HAMÆCYPARIS consists of about 6 species of evergreen trees or shrubs now growing along the eastern and western coasts of North America, in Japan and Formosa, but fossil representatives are reported from Greenland and southern Europe.

The leaves are in opposite pairs, scale-like, ovate, taper-pointed, the tips spreading, or appressed; on sterile branches and on young plants they are longer, linear-lanceolate, and spreading. The flowers are monœcious, small, and borne at the ends of the twigs, the two kinds on different branchlets. The staminate flowers are oblong, consisting of numerous stamens, their filaments stout, with connectives that are broader than long, usually covering 2 nearly globular anther-cells; the pistillate flowers are oblong, consisting of about 6 opposite, peltate, fertile scales bearing 2 to 5 erect ovules, and one or more pairs of sterile scales at the base and apex. The fruit is a small globose cone, ripening the first season and remaining on the branches for some time, formed only of the enlarged ovule-bearing scales of the pistillate flower; the scales are abruptly enlarged, and rounded, flattened or depressed at the apex, and marked by a short, central pointed projection. Seeds 1 to 5 under each cone-scale, ovate to ovate-oblong, the outer coating papery, the inner hard; they have two broad wings and 2 cotyledons.

The great variety of plume-like evergreens cultivated under the name of *Retinospora* are of this genus and belong to the Japanese species *obtus*a and *pisifera*.

The name is Greek, meaning ground cypress, the type species being *C. thyoides*.

Eastern swamp tree; twigs slender, flattened.

1. *C. thyoides*.

Western trees.

Twigs stout, scarcely flattened; leaves glandless or obscurely glandular. 2. *C. nootkatensis*.

Twigs slender, flattened; leaves distinctly glandular.

3. *C. Lawsoniana*.

I. WHITE CEDAR — *Chamæcyparis thyoides* (Linnæus) B. S. P.*Cupressus thyoides* Linnæus. *Chamæcyparis sphaeroidea* Spach

Probably the most beautiful of our eastern cone-bearing trees, this occurs in swamps and very wet woods from southern Maine near the Atlantic and Gulf coasts to western Mississippi, often standing in 1 meter of water, sometimes forming pure forests. Its maximum height is 24 meters, with a trunk diameter of about 1.2 meters. It is also called Swamp cedar and Juniper.



FIG. 78. — White Cedar, southern New Jersey.

The trunk is tall and straight; the slender horizontally spreading branches form a narrowly conic tree. The bark is about 2 cm. thick, irregularly furrowed into narrow flattish, ridges which separate into long reddish brown, fibrous scales. The twigs are flattish, light green, becoming round, reddish brown, and finally dark brown. The leaves are bluish green, dull, scale-like, ovate, 1 to 2 mm. long, 4-ranked, imbricated, sharp-pointed, keeled, closely appressed, except on young or vigorous twigs, where they are awl-shaped with spreading tips; they bear a small but distinct gland on the back; they turn reddish brown after two years, but remain on the branchlets for several years longer; those of seedlings are linear, sharply pointed, spreading, 5 or 6 mm. long. The flowers appear in March or April; the staminate are oblong, 2 to 3 mm. long, their 10 to 12 stamens with broad ovate connectives; the pistillate flowers are about 2 mm. in diameter, of a reddish color and have about 6 sharp-pointed ovate spreading fertile scales each



FIG. 79. — White Cedar.

usually bearing 2 ovules. The cones are globose, 5 to 7 mm. in diameter, sessile or nearly so, bluish purple and very glaucous when young, turning red-brown; the scales are flattish or somewhat sunken at the top and bear a short conic tip. Seeds 1 or 2 under each fertile scale, ovate, pointed at the apex, obtuse at the base, about 2 mm. long, compressed, their wings as broad as the seed-body or narrower.

The wood is soft, rather weak, close-grained, light reddish brown, becoming darker with age; its specific gravity is about 0.33. It is very durable, easily worked, and is much used in cooperage and general carpentry, for boats, shingles, posts and railroad ties. This

durable and valuable wood is dug out of swamps, especially in southern New Jersey.

2. SITKA CYPRESS — *Chamæcyparis nootkatensis* (Lambert) Spach

Cupressus nootkatensis Lambert

A tall slender tree occurring from Alaska southward through British Columbia and Washington to Oregon. At the north it occurs at sea level, southward it is found at higher elevations up to 1200 meters, where it is often reduced to shrubby forms. Its maximum height is 36 meters, with a trunk diameter of 1.8 m.

The trunk is tall and straight, its branches spreading, forming a narrowly conic tree. The bark is 12 to 18 mm. thick, irregularly furrowed into brownish



FIG. 80. — Sitka Cypress.

gray ridges, their surface separating into thin scales, and exposing a bright brown-

ish inner bark. The twigs are rather stout, nearly round, slightly flattened, light yellow or reddish, becoming red-brown after the leaves fall, and finally grayish. The leaves are dull bluish green, ovate, 3 mm. long, long-pointed, without glands or faintly glandular-pitted on the back, closely appressed, except on young or vigorous twigs, where they are larger, spreading, and more pointed; they dry after about two years, but remain upon the branches for another year. The flowers, which open in early spring, or at high altitudes in summer, are at the ends of small twigs; the staminate are oblong, about 5 mm. long, composed of 8 to 10 stamens, with light yellow, broadly ovate connectives; the pistillate flowers are of a light reddish color, 1.5 mm. long, composed of ovate sharp-pointed scales, the fertile scales with 2 to 4 ovules. The cone, which ripens in early autumn is subglobose, about 12 mm. in diameter, dark red-brown, glaucous, and consists of 4 to 6 scales, each tipped with a stout conic projection and bearing 2 to 4 seeds; these are ovate, 6 mm. long, sharp-pointed, somewhat flattened, of a reddish brown color, the wings lighter colored, sometimes twice as wide as the body.

The wood is hard, rather brittle, very close-grained, yellow, satiny, and aromatic; the specific gravity is about 0.48. It is very durable, easy to work, and is used in boat-building, cabinet work, and has been exported to Asia for use instead of satinwood.

It is much cultivated in Europe and to some extent in the United States; a number of horticultural varieties are now known. In cultivation it is frequently known under the name *Thujaopsis borealis* Carrière. Yellow cypress, Yellow cedar, Nootka cypress, Nootka sound cypress, Alaska ground cypress, and Alaska cypress are common names for this tree.

3. PORT ORFORD CEDAR — *Chamaecyparis Lawsoniana* (A. Murray)

Parlatore

Cupressus Lawsoniana A. Murray

This, the tallest of the Ground cypresses, is an inhabitant of sandy ridges on the coast, and of mountain sides from sea level to an altitude of 1500 meters in southwestern Oregon and northern California. Its maximum height is 60 meters, with a trunk diameter of 3.6 m. above the abruptly enlarged base. It is also called Oregon cedar, White cedar, Lawson's cypress, and Ginger pine.

The trunk is much swollen at the base, but narrower immediately above it, tall and straight. The branches are horizontal, or somewhat drooping, forming a narrow, conic head. The bark of old trees is up to 2.5 dm. thick, one-third less thick on smaller stems, furrowed into rounded ridges, the surface separating into small, irregular scales of a reddish brown color; on very young trees and branches it is thin and nearly smooth. The twigs are slender, flattened, and pale green, becoming round and reddish or brown. The leaves are light green, ovate, appressed, 1.5 mm. long, sharp-pointed, with a distinct gland on the back; on young or vigorous twigs they are several times larger, often spreading at the apex

and long-pointed; they turn red-brown and become dry after about three years. The flowers open in spring; the staminate are oblong, with about 12 stamens, their broad connectives red; the pistillate flowers are darker in color and composed of several ovate spreading, pointed scales each bearing about four ovules. The cones,



FIG. 81. — Port Orford Cedar.

which ripen in the first autumn, are abundantly produced on the upper twigs; they are globose, about 10 mm. in diameter, reddish brown, more or less glaucous, composed of 8 or 10 scales with a ridged flattish or sunken apex tipped with a short sharp conic projection; the seeds, of which there are 2 to 4 under each scale, are ovate, 3 mm. long, slightly flattened, sharp-pointed, light brown, and broadly winged.

The wood is hard and strong, clear-grained, resinous and satiny, pale yellow to nearly white; its specific

gravity is about 0.46; it is very durable, easily worked, and takes a good polish, and is largely used for interior finish of buildings and ships, also for fences, railroad ties, posts, and matches. The resin is strongly diuretic and is also used as an insecticide.

As an ornamental plant it is well known on the Pacific slope, and in Europe, but it does not thrive well in the eastern States.

XIII. THE JUNIPERS

GENUS **JUNIPERUS** (TOURNEFORT) LINNÆUS



JUNIPERS are mostly scaly-leaved, evergreen trees or shrubs of the northern hemisphere, throughout which they are widely distributed from the arctic circle southward to the West Indies, the Canary islands, and the mountains of northern Africa, China and Japan. About 40 species are known, of which 12 arborescent and about 4 shrubby species occur in our area. They are of economic importance on account of the soft aromatic wood, which is greatly valued, especially in the manufacture of lead-pencils. The bark is rich in tannic acid and is used in tanning leather. The volatile oil,

distilled from the fruit of some species, known as oil of juniper berries, is aromatic, stimulant and diuretic, while spirits distilled with or through the berries of the common Juniper constitutes the gin of commerce. The berries are also used in medicine; a tar is made by the destructive distillation of the wood of *Juniperus Oxycedrus* Linnæus, of Europe, known in the drug trade as oil of cade. The fleshy fruit of *Juniperus drupacea* Labillardière, of Greece and Syria, is succulent and edible. Some of the species and many of their horticultural varieties and forms are much esteemed for decorative planting.

They have opposite or verticillate, sessile, awl-shaped, or scale-like leaves, usually of two kinds; the leaf-buds are scaly or naked. The flowers are diœcious or monœcious, very small, terminal or axillary, globose to oblong. The staminate ones are composed of a slender axis with several opposite or ternate stamens with short filaments; their connectives are entire or slightly toothed, yellow, ovate or broader than long, bearing from 2 to 6 oblong, 2-valved anther-cells opening lengthwise. The pistillate flowers are composed of a few mostly opposite ovate, fleshy scales, each bearing 1 or rarely 2 erect ovules, subtended by many scale-like bracts which persist at the base of the usually globular fruit. The fruit is a short stalked cone, berry-like in many species, formed by the fusion of the scales of the pistillate flower, requiring one, two, or three years to mature; it is black, blue, or reddish in color, often with a bluish bloom, smooth, or roughened by the projecting tips of the scales. The flesh is juicy, resinous and glandular, or in some species sweet, and nearly dry; seeds solitary to several, ovoid, sharp or blunt-pointed, round or angled, often grooved lengthwise, wingless, smooth or rough; endosperm fleshy; embryo straight; cotyledons 2 to 6.

The name is the ancient name of the Juniper, the type species being *Juniperus communis* Linnæus.

Flowers axillary; leaves narrowly linear-lanceolate and prickly-pointed.

[True *Juniperus*.]

1. *J. communis*.

Flowers terminal; leaves of two kinds, scale-like and awl-shaped. [Genus *Sabina*.]

Fruit reddish brown, at least when old, dry, and fibrous.

Seeds solitary or few; cotyledons 4 to 6.

Leaves glandular.

Seed 6 to 8 mm. long, not grooved or but little; California tree.

2. *J. californica*.

Seed 4 to 6 mm. long, much grooved; Texas tree.

3. *J. Pinchoti*.

Leaves not glandular.

4. *J. utahensis*.

Seeds 4 to 12; cotyledons 2; southwestern trees.

Bark thin, separating into papery scales; leaves acute or acuminate.

5. *J. flaccida*.

Bark 2 to 10 cm. thick, separating into thick plates; leaves minutely pointed.

6. *J. pachyphlwa*.

Fruit blue, juicy, resinous.

Leaves denticulate; western trees.

Twigs stout; leaves in 3's, glandular on the back.

7. *J. occidentalis*.

Twigs slender; leaves mostly in 2's, usually glandless.

Leaves light green, about 3 mm. long, acute or acuminate

Leaves dark green, about 1.5 mm. long, obtuse or acutish.

Leaves entire.

Eastern trees; fruit maturing the first season.

Fruit 5 to 6 mm. long; branches not pendulous, or slightly so.

Fruit 3 to 4 mm. long; branches pendulous.

Western tree; fruit maturing the second season.

8. *J. monosperma*.

9. *J. mexicana*.

10. *J. virginiana*.

11. *J. barbadensis*.

12. *J. scopulorum*.

1. COMMON JUNIPER — *Juniperus communis* Linnæus

Often a low shrub, the Common juniper sometimes becomes a tree 9 meters high with a trunk diameter of 3 dm. Its range is from Greenland and Labrador to Alaska, south to Pennsylvania, Nebraska and New Mexico; also in Europe and Asia; it is also called Dwarf juniper. It has escaped from cultivation in Georgia.

The trunk is usually excentric and irregularly ridged. The branches are slender, nearly erect, forming a narrowly conic tree. The bark is about 1.5 mm. thick, splitting into persistent scales of a reddish brown color. The twigs are slender, 3-angled, smooth, and reddish yellow. The buds are ovoid and scaly. The leaves, which persist for many years, are in whorls of 3, widely spreading, narrowly linear-lanceolate, 1 to 2 cm. long, tapering to a very sharp-pointed apex, widest near or at the sessile base, slightly concave, white-glaucous and with

many stomata above, keeled, dark green and shining beneath, becoming brownish in winter. The flowers are axillary, dioecious, or monœcious, solitary, appearing in spring from buds formed the previous season. The staminate are sessile, narrowly ovoid, 4 to 5 mm. long, consisting of several whorls of 3 stamens each, their connectives broadly ovate, sharp-pointed, with 3 or sometimes 4 anther-sacs at the base. The pistillate flowers consist of 3 minute scales each bearing a single ovule, and subtended by several sterile scales in whorls of 3. The fruit, which requires 3 seasons to ripen, consists of the 3 upper scales of the flower united about the ovules; it is sub-globose, 6 to 8 mm. in diameter, blue or nearly black, with a bloom,



FIG. 82. — Common Juniper.

short-stalked, and unless devoured by birds often remains upon the twigs for several years. The seed is ovoid, 3 mm. thick, flattened and 3-angled, sharp-pointed, brown, and roughened by deep resin glands.

The wood of the Common juniper is hard, close-grained, light brown; its specific gravity is about 0.67. It is very durable, receives a fine polish, and is used in Europe for stakes, cups and walking sticks, and is also important for fuel. It has been cultivated for centuries in European gardens, and stands the most severe

clipping and was a great favorite for hedges, especially when topiary gardening was in vogue. A great many varieties are now in cultivation.

The Low Juniper, *Juniperus sibirica* Burgsdorf, is a low shrub, with stems radiating from a central root, sometimes appearing like a gigantic bird's-nest, with stouter and often shorter leaves which are sometimes curved; it grows on hills in the northern parts of the north temperate zone, occurring in the United States as far south as New York, Michigan, and Utah; it is doubtfully distinct as a species, however, from *Juniperus communis*.

2. CALIFORNIA JUNIPER — *Juniperus californica* Carrière

This cone-shaped tree occurs on dry mountain slopes and high plains of the coast ranges and along the Sierra Nevada Mountains of California into Lower California, at altitudes of 900 to 1200 meters. It is also called White cedar, Sweet-berried cedar, and Sweet-fruited juniper, and reaches a maximum height of 12 meters with a trunk diameter of 6 dm., although frequently only a shrub.

The trunk is straight, ridged and more or less irregular. The branches are stout, erect, or irregularly ascending. The bark is thin and peels off into long, gray shreds, which persist on the trunk for a long time; the inner bark is reddish brown. The twigs are stout, yellowish green, becoming



FIG. 83. — California Juniper.

red and finally light gray, after the leaves have fallen from them. The scale-like leaves are mostly 3 in each whorl, yellowish green, tightly appressed, ovate to oblong-ovate, about 2 mm. long; they are convex, and distinctly glandular pitted on the back, bluntly pointed at the thickened apex and slightly fringed on the margin; on young plants or on vigorous twigs they are 2 or 3 times as long, linear or awl-shaped, sharply pointed, and whitish above. The flowers open in late

winter or early spring. The staminate are 3 to 6 mm. long, consisting of 18 to 24 stamens, usually in whorls of 3; their connectives are broader than long and denticulate. The pistillate flowers consist of several sessile ovaries subtended by about 6 spreading sharp-pointed scales. The fruit, which matures in the autumn of the second year after fertilization, is globular or oblong, 12 to 20 mm. long, almost smooth, reddish brown, with a glaucous bloom; its flesh is firm, dry, and sweet. Seeds 1 or sometimes 2, ovoid, rather large, sharp-pointed, angled, and somewhat flattened on the inner side when there are 2 in a fruit; they are light brown, and shining above, yellow and dull toward the base.

The wood of the California juniper is soft, close-grained, and light reddish brown; its specific gravity is about 0.63. It is very durable and is used for fencing and for fuel. The fruit is used by the Indians of its region as food, either fresh, or dried and ground into meal and baked.

3. PINCHOT'S JUNIPER — *Juniperus Pinchoti* Sudworth

This very recently described Juniper occurs in thin, dry soil of flat grassy bottoms in the Paloduro Cañon of Briscoe, Randal, and Armstrong counties, Texas, where it attains a height of 6 meters with a trunk diameter of 1.25 dm.



FIG. 84. — Pinchot's Juniper.

The trunk is very short; usually there are several trunks from an old fire-killed stump. The bark is thin, shallowly fissured into narrow, confluent, persistent scales of an ashy gray color; the inner bark is dull brown. The twigs are rather slender, yellowish brown, finally gray and somewhat scaly. The leaves are yellowish green, usually in 3's, but often in 2's, closely appressed, about 2 mm. long, sharply stiff-pointed, entire on the margin, thickened, keeled, and with a conspicuous depressed gland on the back; on young or very vigorous twigs they are spreading at the very sharp-pointed apex, linear-lanceolate, 6 to 12 mm. long, and glandular on the back. The fruit, ripening probably in the second season, is globose or slightly oblong, about 8 mm. long, nearly smooth, distinctly red or copper-colored with little or no bloom; its flesh is thick, dry, and sweetish, seeds 1 or 2, broadly ovoid, 4 or 5 mm. long, grooved,

brown and shining toward the sharp-pointed apex.

The wood is rather soft, close-grained, light brown with a slight tinge of red. It is only moderately durable in contact with the soil and is used locally for fence-posts and for fuel. Its habit of throwing up vigorous sprouts from the stumps after being repeatedly killed to the ground by fire should make it very valuable in the forestry operations of desert regions. Where it grows it is associated with the One-seeded juniper, which, however, is confined to the sides of the cañons, and not subjected to fires, which it could not withstand. The species is related to *Juniperus gigantea* K. Koch, of Mexico.

4. UTAH JUNIPER — *Juniperus utahensis* (Engelmann) Lemmon

Juniperus californica utahensis Lemmon

A tree or shrub of the Great Desert region, where it is often the most abundant arborescent plant, at an altitude of about 1500 meters, becoming larger but more scattered on the dry, mountain sides up to 2400 meters; it extends from Wyoming and eastern Utah to Nevada, southeastern California, western Colorado and northern New Mexico, attaining a maximum height of 6 meters with a trunk diameter of about 6 dm. It is also called Desert juniper.

The short trunk is more or less excentric and often irregularly furrowed into rounded lobes. The numerous crooked branches are erect or ascending, forming an open head. The bark is about 6 mm. thick, pale gray to nearly white, splitting into thin, persistent scales. The twigs are slender, at first yellowish green, becoming, after the leaves fall off, light red and scaly. The leaves, persisting for many years, are pale green or yellowish green, rounded and without glands on the back; on young plants and on vigorous twigs they are needle-shaped and sharp-pointed. The staminate flowers consist of 18 to 24 stamens, arranged in opposite pairs or in 3's; their connectives are broad and minutely toothed. The pistillate flowers consist of several thick, spreading, sharp-pointed fertile scales. The fruit is bluish at first, but reddish brown and glaucous when ripe; at the end of the second season it is globose or oblong, 6 to 12 mm. long, the short tips of its component scales often distinct; its flesh is quite sweet, dry, and



FIG. 85. — Utah Juniper.

The fruit is bluish at first, but reddish brown and glaucous when ripe; at the end of the second season it is globose or oblong, 6 to 12 mm. long, the short tips of its component scales often distinct; its flesh is quite sweet, dry, and

fibrous; seeds 1 or rarely 2, ovoid, 3 mm. long, sharp-pointed, compressed toward the apex, sharply angled; cotyledons 4 to 6.

The wood is soft, close-grained, and light brown; its specific gravity is about 0.55. It furnishes the chief supply of fuel to many of the mines and ranchmen of its region, where it is also used for posts; its fruit is used by Indians for food.

The recently described *Juniperus Knightii* Nelson, of the red desert lands of southwestern Wyoming, must, in our judgment, be referred to this species.

5. DROOPING JUNIPER — *Juniperus flaccida* Schlechtendal

This Juniper occurs on the mountains of eastern Mexico at altitudes of from 1800 to 2400 meters and grows in the United States only on some of the mountains of southwestern Texas. It attains a height of about 9 meters, but is often only a shrub.

The trunk is upright; its branches are long, slender, and spreading. The twigs are slender and pendulous, light green at first, becoming light brown and covered with loose, papery bark.



FIG. 86. — Drooping Juniper.

The leaves are opposite, appressed, or slightly spreading, ovate to ovate-lanceolate, glandular-pitted, about 4 mm. long, sharply taper-pointed, slightly toothed on the margin, becoming brownish red before falling off; on young plants or vigorous twigs they are broadly lanceolate, often 10 mm. long, with a long-pointed apex. The staminate flowers are oblong, 4-sided, consisting of 16 to 20 opposite stamens with ovate, pointed connectives bearing several anther-sacs. The pistillate flowers consist of few thickened, sharp-

pointed, spreading scales bearing several ovules. The fruit is globular or somewhat longer than thick, 12 to 16 mm. in diameter, reddish brown, more or less

glaucous, somewhat roughened by the persistent tips of the scales; the flesh is dry and non-resinous; seeds 4 to 12, some of them often imperfect; cotyledons 2.

Not hardy at the north, this tree grows well in the Mediterranean region.

6. THICK-BARKED JUNIPER — *Juniperus pachyphlæa* Torrey

Growing in the arid regions of southwestern Texas, New Mexico, Arizona, and southward into Mexico up to at least 2000 meters, this juniper attains a maximum height of 18 meters with a trunk diameter of 1.5 m., and is also known as Checkered-barked juniper, Alligator juniper, Oak-barked juniper, Oak-barked cedar, Thick-barked cedar, and Mountain cedar.

The trunk is short, its branches long, stout, and spreading, forming a loosely conic tree, or sometimes a dense round head. The bark is 2 cm. to nearly 1 dm. thick, deeply divided into thick scaly 4-sided plates of a dark reddish brown color. The twigs are slender, usually light red and scaly after the leaves have fallen off. The leaves are appressed in opposite pairs, bluish green, ovate, about 2 mm. long, bluntish-pointed at the apex, minutely toothed on the margin; on young plants and vigorous twigs they are larger, lanceolate, and long-tipped. The flowers open in late winter or spring; the staminate are oblong, about 3 mm. long, composed of 10 or 12 stamens with light yellow ovate, short-pointed connectives. The pistillate flowers have few, spreading, ovate, and taper-pointed scales. The fruit ripens in the autumn of the second year, is globular or oblong, about 12 mm. long, usually dark reddish brown, and distinctly glaucous and roughened by the projecting tips of the scales, sometimes open at the apex and exposing the seed. The flesh is dry, sweet and mealy; seeds generally 4, ovoid, sharp-pointed, light brown, strongly ridged; cotyledons 2.

The wood is soft, weak, and brittle, close-grained, light red; its specific gravity is about 0.58.

The fruit is used for food by the Indians. The tree is unlike any other Juniper in its peculiar thick bark which has given it its botanical name and most of its local names. It would be a desirable acquisition to parks and gardens if it would grow in regions other than those in which it is wild.



FIG. 87. — Thick-barked Juniper.

7. WESTERN JUNIPER — *Juniperus occidentalis* Hooker*Juniperus excelsa* Pursh, not Bieberstein. *Juniperus andina* Nuttall

A tree or shrub, often prostrate, of the mountains of Washington and Idaho, south to the San Bernardino Mountains of California, mostly at altitudes of from 1800 to 3000 meters, reaching a maximum height of about 18 meters with a trunk diameter of 9 dm.; low forms sometimes have trunks of much greater diameter, however. It is also called Western red cedar, Western yellow cedar, Cedar, and Juniper.

The trunk varies from tall and straight to thick and stunted. The branches



FIG. 88. — Western Juniper.

of stunted trees are very large and usually widely spreading, forming a round or flat head. The bark is about 1 cm. thick, light brownish red, shallowly fissured into wide ridges, their surface broken into shining scales. The twigs are stout, becoming red-brown after the leaves have fallen; their bark is very thin. The leaves are light green, whorled in 3's, closely appressed, ovate, 2 mm. long, sharp or taper-pointed, slightly toothed on the margin, distinctly glandular on the back. The staminate flowers are stalked, oblong, blunt, 3 mm. long, consisting of 12 to 18 stamens with broad connectives. The pistillate flowers consist of about 8

spreading ovate, sharp-pointed scales, surrounding several ovaries and subtended by several smaller but similar sterile scales. The fruit is globose or somewhat longer than thick, 6 to 8 mm. long, dark blue with a bloom and nearly or quite smooth; its flesh is dry and resinous. The seeds, usually 2 or 3 in number, are ovoid, about 3 mm. long, sharp-pointed, usually somewhat grooved on the back, brown and shining above; cotyledons 2.

The wood is soft, close-grained, and light red-brown; its specific gravity is about 0.58. It is very durable and is used for railroad ties, fence-posts, and is sparingly sawed into lumber, especially in Oregon.

The Indians use its fruit, like that of other western Junipers, for food.

8. ONE-SEEDED JUNIPER — *Juniperus monosperma* (Engelmann) Sargent*Juniperus occidentalis monosperma* Engelmann

A tree or shrub of the eastern slopes of the Rocky Mountains, from Colorado to Texas and westward to Utah, Nevada, New Mexico and Arizona, at altitudes of 1800 to 2000 meters and reaching a maximum height of 15 meters, with a trunk diameter up to about 9 dm. It is also called the Naked-seeded juniper.

The trunk is usually short, often irregularly fluted. The branches are stout, spreading or ascending.

The bark is irregularly divided into confluent ridges and splits into long, thin, somewhat fibrous scales, light gray externally and red-brown internally. The twigs are slender, and after the leaves have fallen are covered by a thin and loosely scaly, reddish brown bark. The leaves are grayish green, usually in pairs, seldom in 3's, often somewhat spreading at the apex, mostly ovate, 3 mm. long, sharp-pointed, thickened, rounded, and faintly if at all glandular on the back; on young, vigorous twigs they are longer and narrower, sharply stiff-pointed and somewhat glandular, up to 12 mm. long. The tree flowers in March or April. The staminate flowers are oblong, consisting of 8 to 12 stamens, with broad rounded connectives; the pistillate have a few spreading scales. The fruit is somewhat roughened by the tips of the scales, 5 to 7 mm. long, usually dark blue, glaucous, its flesh sweet and resinous. The seeds are usually solitary, rarely 2 or 3, broadly ovoid, angular, slightly grooved and ridged, light brown and shining at the blunt apex; cotyledons 2.



FIG. 89. — One-seeded Juniper.

The wood is rather hard, close-grained, and light reddish brown; its specific gravity is about 0.71. It is very durable, is extensively used for fences and is the principal fuel of an extensive region.

The fruit, like that of other western Junipers, is used as food by the Indians, who grind the dried fruit into meal and bake it. They also make use of the fibrous inner bark for clothing, sleeping mats, and sails.

This plant has been cultivated and is hardy in New England.

9. ROCK CEDAR — *Juniperus mexicana* Sprengel*Cupressus sabinoides* H. B. & K. *Juniperus sabinoides* Nees, not Grisebach

This tree often forms forests and dense brakes in the limestone hills of central and western Texas and extends southward to central Mexico. Its maximum height is about 30 meters with a trunk diameter of 3 dm. or more. It is also called Juniper cedar, Mountain cedar, Cedar, Mountain juniper, and Juniper.

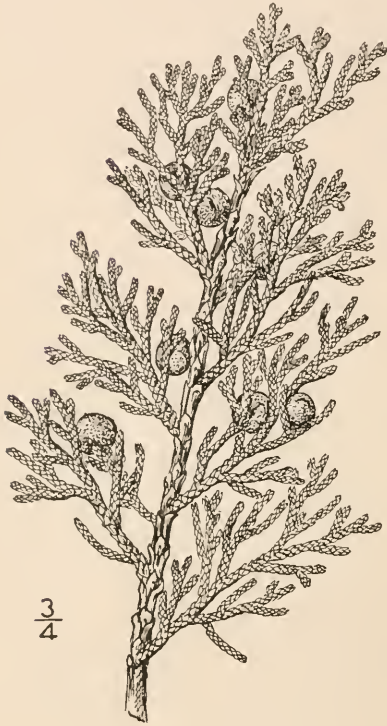


FIG. 90. — Rock Cedar.

The trunk is usually short, sometimes tall. The branches are spreading, forming a conic tree or one with a broad, round top. The bark is 6 to 12 mm. thick, separating into narrow, somewhat fibrous scales of a reddish brown color. The slender twigs are sharply 4-sided, becoming round and light reddish brown or gray and nearly smooth after the leaves have fallen off. The leaves are opposite, closely appressed, ovate, 1.5 mm. long, blunt or sharp-pointed, slightly toothed on the margin, usually glandless on the back; on young plants and vigorous twigs they are 6 to 12 mm. long, stiff and long-pointed. The flowers appear in January or February, the staminate short-stalked and consist of 12 to 18 stamens, their connectives being ovate, blunt, or slightly pointed. The pistillate flowers have thick, ovate, sharp-pointed, spreading scales. The fruit is nearly globular, 6 to 8 mm. thick, dark blue and glaucous; the tips of the flower scales are prominent on the young fruit, but the mature fruit is very nearly or quite smooth, the flesh thin, sweet, and resinous; seeds 1 or rarely 2, ovoid, about 6 mm. long, flattened on the inner face when there are 2 in the fruit, sharp-pointed, prominently ridged, dark brown and shining; cotyledons 2.

The wood is hard, weak, close-grained, and brown; its specific gravity is about 0.59. It is extensively used for general construction, fencing, sills, telegraph poles, railroad ties, and is the chief fuel of the region in which it grows.

10. NORTHERN RED CEDAR — *Juniperus virginiana* Linnæus

This well-known eastern tree is probably the largest of the American junipers, reaching a maximum height of 30 meters, with a trunk diameter of 1.5 m., usually having about half these dimensions and is sometimes a low shrub. It grows in



FIG. 91.—Northern Red Cedar in New York Botanical Garden.

poor or rocky soil from Nova Scotia and New Brunswick to western Ontario and South Dakota, southward to northern Florida, Alabama, and eastern Texas. It is variously known as Red cedar, Red juniper, Savin, Cedar, and Juniper bush.

The trunk is tall and straight, usually ridged, often considerably expanded at the base, and sometimes excentric. The branches are slender, more or less spreading below and ascending or erect above, forming a dense, narrow conic tree, or, when older, sometimes becoming broader and irregularly dome-shaped. The bark is 3 to 6 mm. thick, slightly fissured into long, narrow persistent shreds of a grayish or reddish brown color. The twigs are slender, 4-angled, becoming round and dark reddish brown or gray after the leaves have fallen. The leaves are dark bluish green, sometimes glaucous, 4-ranked, closely appressed, ovate, entire, 1.5 to 2 mm. long, sharp-pointed, rounded, and usually without a gland on the back; they become yellowish and after three or four years brown and dry before falling off; on young



FIG. 92. — Northern Red Cedar.

plants and vigorous twigs they are linear-lanceolate, 1 cm. long or more, and sharp-pointed. The flowers are usually dioecious; very seldom both kinds of flowers are found on the same tree; they appear in early spring. The staminate, which are very profusely produced, are short-stalked and consist of 8 to 12 stamens with very broad, rounded, entire connectives. The pistillate flowers have a few spreading sharp-pointed scales. The fruit ripens the first autumn, is nearly globular when ripe, 5 to 8 mm. thick, the flesh thin, juicy, sweetish, and resinous; seeds 1 or 2, rarely more, ovoid, 3 to 4 mm. long, nearly round, sharp-pointed, sometimes grooved, smooth and shining near the light brown apex; cotyledons 2.

The wood is soft, close-grained, weak, red with a whitish sapwood; its specific gravity is about 0.48. It is aromatic and highly prized for cloth chests and other furniture, various utensils, and used to some extent for pencil wood. Its durability makes it valuable for fence-posts and rustic work. The fruit and leaves have some medicinal value; a volatile oil is distilled from both leaves and wood.

Having been cultivated for a long time in parks and gardens, many varieties or forms have been selected which are highly prized by landscape gardeners.

11. SOUTHERN RED CEDAR — *Juniperus barbadensis* Linnaeus

A tree of the coastal region of southern Georgia and Florida and of the West Indies. It is indigenous in river-swamps in Florida, but has become naturalized as far west as Louisiana. In the island of Jamaica it inhabits mountain slopes and it grows also on Antigua and Santo Domingo. Its maximum height is 15

meters with a trunk diameter of 6 dm.; also called Southern juniper and by many of the names applied to the northern species.

The trunk is similar to that of the Northern red cedar. The branches however, are more slender, ascending and spreading, or the lower ones drooping, forming a broad irregular open head. The bark separates into long, thin shreddy scales of a brownish or grayish color. The twigs are very slender, 4-angled, drooping, becoming, after the leaves fall, reddish brown or gray. The leaves are light green, opposite, closely appressed, ovate, sharp-pointed, entire on the margin, distinctly glandular on the back. The flowers are dioecious, opening in February or March, the staminate 3 to 6 mm. long, composed of about 12 stamens. The pistillate flowers are ovoid, 4 to 5 mm. long, composed of a few sharp-pointed scales, which become blunt in fruit. The fruit is nearly globular, about 4 mm.



FIG. 93.—Southern Red Cedar.

in diameter, dark blue, smooth or slightly marked by the blunt points of the scales. Seeds 1 or 2, ovoid, pointed, ridged, 3 mm. long.

The wood is soft, weak, close-grained, and red; its specific gravity is about 0.49. It is fragrant, very straight-grained, and was, until recently, almost exclusively used by lead-pencil manufacturers but has now become very expensive. The tree is very generally cultivated in the south for ornament and shade, being one of the most beautiful Junipers and the most extensively planted coniferous tree in the south; doubtless many of the garden varieties attributed to the Northern red cedar are forms of this species.

12. ROCKY MOUNTAIN RED CEDAR — *Juniperus scopulorum* Sargent

A tree of the Rocky mountain region, from Alberta and British Columbia to western Texas and Arizona, usually at elevations of 1500 meters or more at the south, but descending to sea level at the north. Its maximum height is 12 meters with a trunk diameter of 9 dm.

The trunk is mostly short, usually divided near the base into several secondary ones. The branches are stout, spreading and ascending, the tree being usually

round-topped, but when perfectly developed the lower branches become somewhat pendulous. The bark is shallowly split into narrow, flat ridges, covered with long somewhat fibrous scales of a reddish brown or reddish gray color. The twigs are slender, 4-sided, becoming round, the smooth bark becoming scaly after the leaves fall away. The leaves are opposite, varying from dark green to pale green and glaucous, closely appressed, sharp or taper-pointed, entire on the margin, rounded and faintly or distinctly glandular on the back. The staminate flowers are oblong, about 2 mm. long, consisting of 8 to 10 stamens, with entire connectives broader than long. The pistillate flowers have few sharp or taper-



FIG. 94. — Rocky Mountain Red Cedar.

pointed, widely-spreading scales. The fruit ripens in the autumn of the second season, is globose, 6 to 8 mm. in diameter, smooth or slightly marked by the tips of the scales, bright blue with a whitish bloom; the flesh is sweet and resinous; seeds one or mostly 2, ovoid, about 4 mm. long, sharp-pointed, conspicuously angled, brown and shining. The wood is similar to that of the Northern red cedar, but much less valuable.

The Shrubby red cedar, *Juniperus prostrata* Aiton, is a depressed shrub seldom more than 1 meter

high with foliage much like that of the Northern red cedar, from which it can readily be distinguished, however, by its light blue fruit, 8 to 10 mm. in diameter, borne on recurved branchlets 4 to 6 mm. long. It grows on banks from Nova Scotia to northern New York, Montana and British Columbia, and has been confused with the European *Juniperus Sabina* Linnæus.

The Bermuda red cedar, *Juniperus bermudiana* Linnæus, is a characteristic tree of the Bermuda islands and is endemic there. It grows on hillsides and along the borders of marshes and attains a great size when very old. It has shreddy bark, dark red wood, widely-spreading branches, and the trunk is sometimes 2 meters in diameter. The contrast between its dark green foliage and the whitewashed houses of Bermuda is very striking. Its leaves are 4-ranked, lanceolate or ovate-lanceolate, pointed, grooved on the back, about 3 mm. long and closely appressed, forming a sharply 4-angled twig; they are

long-persistent on the twigs and when old and dry are somewhat spreading. The tree flowers from December to March. Its fruit is nearly globular, dark blue with a bloom, and about 8 mm. in diameter.

The Bahama red cedar, *Juniperus lucayana* Britton, inhabits the northern Bahama islands, though little is now left of it on account of the use of its wood for lead pencils and formerly in construction. It is not a very large tree, seldom over 10 or 12 meters high, and has very slender twigs and branches which are ascending or the lower drooping. It is most nearly related to *Juniperus barbadensis* Linnæus, from which it differs in its depressed-globose and somewhat laterally flattened fruit; its leaves are 4-ranked, and only about 1.5 mm. long on old twigs, but on young plants and often on the lower parts of older twigs they are needle-shaped, very sharply pointed and often 1 cm. in length. It is probable that this is also the Red cedar of eastern Cuba, but fruit from trees growing there has not yet been obtained.

The recently described *Juniperus megalocarpa* Sudworth, from New Mexico, has large brown non-resinous fruit about 1.5 cm. in diameter, covered with a blue bloom, enclosing one or two nearly orbicular somewhat flattened seeds about 8 mm. in diameter. It attains a height of 16 meters with a trunk over a meter in diameter. Its leaves are in 3's, glandular pitted on the back, yellowish green and appressed. The species is apparently most nearly related to *Juniperus californica* Carrière, but has more slender twigs.

THE YEW FAMILY

TAXACEÆ Lindley



HIS family consists of about 10 genera, comprising some 75 species of slow-growing, slightly resinous and aromatic evergreen trees or shrubs, widely distributed, but most numerous in the southern hemisphere, and also represented by many fossil forms from Greenland southward. They are of little economic value, except that the wood of some is very durable and that of the European yew was highly prized for making bows by the ancients, and it is also used by modern archers. The fleshy covering of the seed of some is quite palatable, although an unfounded superstition would have them deadly poison. As ornaments they have long held a special place in landscape gardening. The bark and leaves of some have had medicinal repute, but their therapeutic value is too little to make them useful in modern practice.

The Taxaceæ have persistent, stiff, simple, and entire spirally arranged leaves, which usually spread so to make them appear as if 2-ranked or opposite. The flowers are monœcious or diœcious, axillary or terminal, devoid of any perianth; the staminate consist of various-shaped scales protecting and supporting the pollen-sacs which open lengthwise. The pistillate flowers consist of a usually solitary ovule, naked or sheltered by imbricated bracts. The fruit is drupe-like, erect, nearly enclosed in an accrescent gelatine-like aril, or naked; seed bony or woody, its endosperm fleshy or mealy, sometimes channeled; cotyledons 2. The North American genera are:

Fruit surrounded by an aril-like cup; endosperm even; pollen-sacs
6 to 8.

1. *Taxus*.

Fruit naked, drupe-like; endosperm channeled; pollen-sacs 4.

2. *Tunion*.

I. THE YEWS

GENUS **TAXUS** [TOURNEFORT] LINNÆUS



HIS genus contains about 6 species of trees or shrubs of the northern hemisphere, never attaining any great height and of no special value, except for ornament. The wood is strong and elastic; that of the Old world yew, *Taxus baccata* Linnæus, is prized for furniture. The fleshy covering of the seed is sweet and edible. The bark and leaves have been employed in medicine, the former also in dyeing.

They have persistent, linear, flat leaves, sometimes a little curved. The usually diœcious flowers appear in early spring from buds formed the previous season; the staminate short-stalked and nearly globular, subtended by an imbricated

cated scaly involucre; they have from 4 to 8 yellow stamens, their filaments short and stout; pollen-sacs 4 to 6, depressed and angular, opening underneath. The pistillate flowers are sessile, consisting of a solitary ovule partly surrounded by a low disk, and subtended by several imbricated scales; the disk enlarges greatly and becomes a persistent fleshy scarlet cup in fruit. The fruit ripens and falls off in the autumn; the seed, which is nut-like, is immersed in but free from the thick red gelatine-like cup-shaped disk; it is ovoid-oblong, sometimes slightly 3-ridged, narrowed and sharp-pointed at the apex, its base marked by an oval or triangular depression; the endosperm is abundant and fleshy, not channeled; cotyledons 2.

The name is the Greek for Yew, probably in allusion to its use for making bows. *Taxus baccata* Linnaeus, of Europe, is the type of the genus.

The genus is represented in America by 4 living species, a low shrub of the northeastern States, *Taxus canadensis* Marshall, called the American yew or Ground hemlock; *T. globosa* Schlechtendal in Mexico; and the two following:

Western tree; leaves 12 to 15 mm. long, yellow-green.

1. *T. brevifolia*.

Florida tree; leaves 20 to 25 mm. long, dark green.

2. *T. floridana*.

1. WESTERN YEW — *Taxus brevifolia* Nuttall

This beautiful evergreen tree or shrub occurs along streams and on slopes usually singly or few together, in the shade of the tall coniferous trees of the region, from British Columbia south to central California, and extends eastward to the Rocky Mountains, in Montana and Idaho, reaching altitudes of 2400 meters. Its maximum height of 24 meters and trunk diameter of 1.2 meters is attained in Oregon. It is also known as Pacific yew, Mountain mahogany, and Yew.

The trunk is tall and straight but often very irregular and ridged. The branches are horizontal or somewhat drooping, long and slender, forming a broad, conic tree. The bark is about 6 mm. thick, flaky, dark reddish purple, the inner layers being much brighter in color. The twigs are slender, green at first, becoming bright brownish red with age. The buds are 1.5 to 3 mm. long, their scales imbricated, yellowish. The leaves persist for four or five years, are linear, flat, straight or slightly curved, 12 to 15 mm. long, sharp-pointed,



FIG. 95. — Western Yew.

entire on the margin and tapering to the short, yellowish leaf-stalk; they are thick and leathery, dark yellowish green and shining above, paler, with a prominent yellowish midrib, beneath. The flowers are bright yellow, the scales subtending the staminate ovate, those of the pistillate flowers broader. The cup surrounding the fleshy seed is globose, 8 to 12 mm. long and brownish red.

The wood is hard, brittle, but strong and elastic, close-grained, bright light red; its specific gravity is about 0.64. It is very durable, and takes a fine polish and is used for fence-posts, fancy cabinet work, bows, canoe paddles, and by the Indians for spear-handles, and many other useful purposes.

It is planted to some extent on the Pacific slope and in Europe for ornament, but does not thrive in the eastern States.

2. FLORIDA YEW — *Taxus floridana* Nuttall

A much smaller tree, often a shrub, occurring with *Torreya* on river banks, in a limited area of Gadsden county, Florida, where it is also called Yew and Savin, and attains a maximum height of 7.5 meters with a trunk diameter of 3 dm.



FIG. 96. — Florida Yew.

The trunk is short. The branches are stout and spreading, nearly horizontal. The bark is about 3 mm. thick, smooth and close, except on very old trees, when it sometimes separates irregularly into thin flat scales of a dark purplish brown color. The twigs are slender, yellowish green, becoming dull brown or reddish. The buds are about 4 mm. long; their imbricated scales are light yellow. The

leaves are flat, linear, 1 to 2 cm. long, 1.5 to 2 mm. wide, straight or slightly curved, bristle-pointed, entire and revolute on the margin, tapering to the short, twisted leaf-stalk; they are dark green and shining above, pale, often glaucous beneath; the midrib is prominent on both sides. The flowers appear in March and April and are bright yellow; both staminate and pistillate are subtended by ovate scales. The fruit, which is quite scarce, ripening in October, is 6 to 10 mm. long; the aril-like cup is bright red and sweet; the seed is ovoid, 5 to 7 mm. long, narrowed to a sharp point at the apex and obscurely wrinkled.

The wood is hard, close-grained, dark reddish brown, the sapwood thin and white; its specific gravity is about 0.63.

As a shrub it greatly resembles the American yew, *Taxus canadensis* Marshall, of the north; it is not known to have been cultivated.

Both this species and the Western yew have been regarded by German authors as varieties of the European *Taxus baccata* Linnæus, but they are quite distinct from it.

II. THE TORREYAS

GENUS **TUMION** RAFINESQUE

Torreya Arnott, not Rafinesque



SMALL genus represented by 4 living species, one each in Florida, California, Japan, and China, and by fossil remains in the arctic regions, and northern Europe.

They have spreading, apparently 2-ranked, linear, flat leaves. The flowers are dioecious, appearing in early spring in the axils of leaves, on twigs of the previous season. The staminate flowers, often crowded, are produced from yellowish scaly buds; they are ovoid or oblong, about 6 mm. long, consisting of 6 or 8 whorls of 4 stamens each and subtended by several ovate overlapping bracts; the stamens have short, flattish stalks, supporting 4 anther-cells. The pistillate flowers are solitary, erect, and sessile, surrounded by the bud-scales, consisting of an ovule surrounded by a thin, fleshy layer. The fruit is ovoid or obovoid, drupe-like, separating, when ripe, from the basal scales, and consists of a thin outer resinous, leathery covering close to the thick hard woody coat of the ovoid or oblong, sharp-pointed seed; endosperm irregularly channeled and white.

The fruit of the Japanese species, *Tumion nuciferum* (Linnæus) Greene, is used as food, and an oil expressed from it is used in cooking. These trees sprout profusely from the stumps and roots when cut. The name is Greek, and was an ancient name of the Yew. The Chinese species, *Tumion grande* (Gordon) Greene, has leaves less sharply pointed than the others. *T. taxifolium* is the type of the genus.

Leaves pale beneath, fœtid; fruit purple; Florida tree.

Leaves green beneath, aromatic; fruit purplish green; California tree.

1. *T. taxifolium*.

2. *T. californicum*.

1. FLORIDA TORREYA — *Tumion taxifolium* (Arnott) Greene*Torreya taxifolia* Arnott

This medium-sized, ill-scented, but beautiful tree, is confined to a narrow region bordering on the Appalachicola river in Gadsden county, Florida, occurring in limestone soil and in river-swamps, attaining a maximum height of 18 m. with a trunk diameter of 9 dm. It is also called Torrey tree, Stinking cedar, Stinking savin, Fœtid yew, and Savin.

The trunk is short; the branches are in whorls, spreading and somewhat

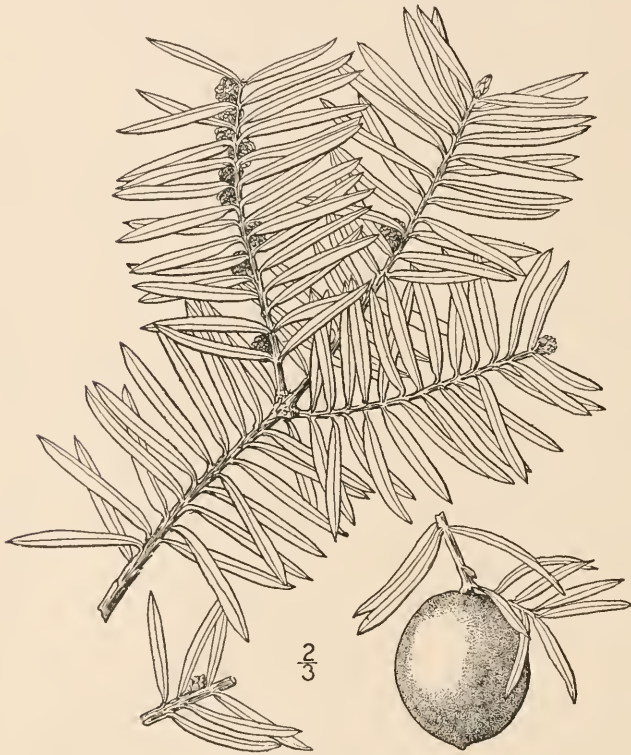


FIG. 97. — Florida Torreya.

drooping, forming an open broad conic tree. The bark is about 12 mm. thick, broadly but shallowly fissured into low irregular ridges, which are covered with close thin scales, brown externally, yellowish internally. The twigs are round, slender, slightly hairy, bright green, gradually becoming dark yellowish red. The winter buds are ovoid, about 6 mm. long, pointed, their scales ovate, thickish, sharp-pointed and shining. The leaves are linear, nearly straight, 1.5 to 4.5 cm. long, somewhat narrowed at the hard sharp-pointed apex, rounded and short-stalked at the base, en-

tire and slightly revolute on the margin, dark green and shining above, pale and faintly longitudinally grooved beneath. The staminate flowers are sub-globose, about 6 mm. long, their scales thick and stiff, keeled on the back, the lower pointed; the anthers are light yellow. The pistillate flower is broadly ovoid, 3 mm. long, narrowed at the apex, its ovule covered by a purple, pulpy coating and subtended by ovate or rounded scales. The fruit, which is rather sparingly produced, ripens in summer, but persists until late autumn; it is globose-oblong or somewhat ovoid, 3 to 4 cm. long; the seed is light reddish brown.

The wood is hard, strong, but rather brittle, close-grained, light yellow, and

satiny; its specific gravity is about 0.51. It is very durable in contact with the soil and is locally used for fence-posts; when cut down the stumps sprout freely, thereby preventing, in a measure, its extermination. It is partly hardy in the middle and eastern States, but does not develop the beauty attained in its native haunts. It is most desirable that the small area in Florida inhabited by this tree and by the Florida yew, should become a reservation.

2. CALIFORNIA NUTMEG — *Tumion californicum* (Torrey) Greene

Torreya californica Torrey

This tree is much larger than the Florida *Torreya* and has a more agreeable odor; it does not form forests, but occurs sparingly over a wide area in north-central California, especially along mountain streams, both in the coast ranges, and on the western side of the Sierra Nevada, from Butte county to Tulare county, at elevations of from 900 to 1500 meters, reaching a maximum height of 30 meters with a trunk diameter of 1.2 meters in the northern part of its range. It is also called California *Torreya*, California false nutmeg, Coast nutmeg, Yew, and Stinking cedar.

The branches are in whorls, slender, spreading, or slightly drooping, forming a magnificent conic or round-topped tree. The bark is about 1 cm. thick, deeply and broadly furrowed into somewhat irregular ridges, covered with long rather loose scaly plates, brownish or yellow-brown.

The twigs are slender, light green, soon becoming darker and finally red-brown; buds ovoid, 6 mm. long, sharp-pointed, their scales thick, ovate, sharp-pointed, reddish. The leaves are linear, straight or slightly curved, 3 to 7 cm. long, tapering toward the sharp-pointed apex, abruptly narrowed at the base, entire and revolute on the margin, thick and firm, bright dark green and shining above, paler and with 2 longitudinal grooves beneath. The staminate flowers are obovoid, about 8 mm. long, their scales thin, broadly ovate. The pistillate flowers are nearly 6 mm. long, their scales oblong-ovate and blunt. The fruit is ovoid or oblong-ovoid, 2.5 cm. long, light green, with purplish streaks or blotches,



FIG. 98. — California Nutmeg.

its flesh gelatinous; seed-coats thin, the inner irregularly impressed into the endosperm, giving it the appearance of a nutmeg, whence the common name.

The wood is soft, rather weak, close-grained and satiny, light yellow; its specific gravity is about 0.48. It is sometimes used as fence-posts, for which its durability makes it very desirable.

Podocarpus, another genus of the Yew Family, is represented by several species in the mountains of the West Indies.

The Ginko, *Ginkgo biloba* Linnæus, that peculiar tree with deciduous, fan-shaped leaves, coming to us from Japan and sometimes called *Salisburia adiantifolia*, was formerly placed in this family, but on account of important differences it is now considered the type of a distinct family. It is one of the most striking and curious as well as most successful of shade trees, thriving almost all over the United States and is remarkably free from insect or fungus affections. Its large oily fleshy-covered fruit, however, is very disagreeably odorous and its dropping in great numbers on sidewalks has caused some painful accidents to persons stepping upon them. It has not become naturalized. It is commonly called Maidenhair tree, from the similarity of its leaves in shape to the leaflets of some Maidenhair ferns.

CLASS ANGIOSPERMÆ

COVERED-SEEDED PLANTS



THE Angiospermæ include all plants in which the ovule or ovules are contained in a closed ovary, which is surmounted by a stigma or stigmas, either with or without the intervention of a style. The pollen grains from the anthers fall upon the stigmatic surfaces, or are brought to them in one way or another and send out delicately filiform tubes of microscopic thickness, which grow through the style or ovary until they reach the ovules and fertilize them, enabling them to ripen into seeds. The ripened ovary, containing the seed or seeds, forms the fruit, which is very various in form and structure. By far the greater number of trees belong to this class.

The class Angiospermæ is formed of two sub-classes: (1) Monocotyledones, in which the embryonic plant within the seed has but a single leaf; the foliage leaves are mostly parallel-veined, and the parts of the flowers are mostly in 3's or 6's; (2) Dicotyledones, in which the embryo has two seed-leaves, the foliage-leaves are mostly pinnately or palmately veined, and the floral parts in 4's, 5's, or multiples of these numbers.

SUBCLASS MONOCOTYLEDONES



HIS subclass of plants is characterized by the simplicity of its stem structure, the fibro-vascular bundles being arranged in a single column without pith or medullary rays, consequently there are neither radiating nor concentric markings in the wood. The outer portion is without true bark, being of the same structure as the inner, except that it is more compact and harder, the woody bundles being closer together with less cellular tissue intervening. The stems are usually not enlarged by growth near the circumference, as there is no cambium; on this account they are also called Endogens or inside growers.

The leaves, with few exceptions, are parallel-veined, there being few connecting or reticulating veins; the leaves are also usually alternate and without stipules, and, with the exception of the palms, are mostly simple.

The seed, however, affords the most striking characteristic of this subclass, in that its embryo has but one cotyledon (seed-leaf), hence the name Monocotyledones.

Most of the plants of this subclass are herbaceous; the greater number of aquatic flowering plants belong here, also the Grasses, Sedges, Lilies, Bananas, and Yams; the woody plants of this group are mostly members of the Smilax family, climbers often called Greenbriers, the roots of some species constituting the well-known drug called Sarsaparilla; of the Dracæna family, and the Palms, the two latter groups being represented in our flora by some 20 arborescent species.

Leaves pinnately or palmately compound; ovule 1 in each cavity of the ovary.

PALM FAMILY.

Leaves simple, elongated; ovules many in each cavity of the ovary.

DRACAENA FAMILY.

THE PALM FAMILY

ARECACEÆ Reichenbach



ONSISTING of some 130 genera with about 1000 species of woody plants, most of which are tall, upright trees, some have long, creeping stems at or near the surface of the soil, others have very short, upright stems or heads, and a few, like the genus *Calamus*, are climbers. They are indigenous to the warmer portions of both hemispheres, but fossil remnants have been found as far north as Greenland.

They are of considerable economic value and serve a wide range of utilities. The wood, although very inferior to that of most other trees, is largely used in the tropics for general construction. The fruits of many kinds are edible and used as food, especially the Date palm, *Phoenix dactylifera*, of northern Africa, and the Coconut. Fixed oils of great value for food and many other purposes are expressed from the fruit of some; most important of these, aside from Coconut oil, being Palm oil, derived from *Elæis guineensis* Jacquin, of western Africa. A wax called Carnauba wax is the exudation of the leaves of *Copernicia cerifera* (Arrado) Martius, of South America. The sap of several, especially the Sugar palm, *Arenga saccharifera* Labillardière, and the Coconut palm, yields much sugar; the juices are also fermented into a variety of alcoholic beverages and into vinegar. Sago is obtained from the soft inner portion of the stem of the Sago palm, *Metroxylon Sagu* Rottboell, of the East Indies. The large hard bony seed of *Phytelephas macrocarpa* Ruiz and Pavon, of South America, known as vegetable ivory, is made into many very useful small articles, such as buttons. Rattan is the flexible stem of various species of *Calamus* from the East Indies; the fruits of some species also exude a red, resin-like balsam, known as Dragon's blood in the drug trade. That all-important, oriental masticatory, Betel nut, is the seed of *Areca Catechu*. The leaves of numerous kinds of palms are used for thatching the houses of the tropics, and are also separated into narrow strips and woven into hats, matting, ropes, and other useful articles.

The palms have ample, alternate leaves, derived from a single bud at the end of the stem; these are usually cleft, divided or parted, either palmately or pinnately, often with prickly or filamentiferous margins; petiole-bases imbricated and often prickly. The flowers, usually in more or less compound axillary clusters, are perfect or polygamous, the 2-ranked perianth consisting of a 3-lobed or 3-parted calyx, the corolla equally parted or lobed; stamens usually 6, sometimes 9 to 12, their filaments dilated or united at the base, their anthers introrse; the pistil consists of 3 carpels, united or distinct; ovules solitary in each carpel. The

fruit is usually a drupe, or sometimes berry-like with a hard usually horny endosperm, often hollow and rarely channeled; embryo near the surface.

In addition to the following arborescent genera, *Rhapidophyllum* is represented in our area by the shrubby *R. Hystrix* (Fraser) H. Wendland, the Blue palmetto, or Needle palm of the southeastern states.

Leaves nearly orbicular, palmately cleft.

Calyx and corolla united into a 6-lobed or truncate perianth.

Endosperm of seed smooth; fruit white or nearly white when ripe

1. *Thrinax*.

Endosperm channeled; fruit black when ripe.

2. *Coccothrinax*.

Calyx and corolla distinct, not united.

Petioles unarmed.

3. *Sabal*.

Petioles armed.

Filaments separate, slender; Californian.

4. *Neowashingtonia*.

Filaments triangular, united into a cup; Floridian.

Seed oblong; low palm usually with underground stem.

5. *Serenoa*.

Seed depressed-globose; slender erect palm.

6. *Paurotis*.

Leaves longer than wide, pinnately parted.

Endosperm of seed not enclosing a watery fluid; stamens exserted.

Fruit oblong, sessile.

7. *Roystonea*.

Fruit 2-lobed or 3-lobed, stalked.

8. *Pseudophœnix*.

Endosperm bony, hollow, enclosing a watery fluid; stamens included.

9. *Cocos*.

I. THE THATCH PALMS

GENUS **THRINAX** SWARTZ



IX or 8 species of Thatch palms are known, natives of Florida, the West Indies, and Central America. They have slender trunks and round, palmately cleft leaves, with smooth stalks, the leaf-segments 2-cleft, the ligule at the base of the leaf-blade hard, short, usually pointed, the base of the leaf-stalk expanded into a broad, fibrous sheath.

The flowers are in stalked, drooping, or spreading panicles, subtended by several leathery, tube-like spathes, and are very numerous, small, perfect, and either distinctly stalked or nearly sessile; the calyx and corolla are united into a 6-lobed perianth; the 6 stamens are borne on the base of the perianth and have either subulate or nearly triangular filaments; the 1-celled ovary tapers into a rather slender style, tipped by a flat or concave stigma, which is oblique in some species. The fruits are small globose drupes, white or greenish white when ripe, the thin flesh enclosing the hard smooth brown seed.

Thrinax (name from the Greek) has as its type species, *Thrinax parviflora* Swartz, of Jamaica; two species inhabit southern Florida.

Flowers nearly sessile; filaments triangular, united below.

1. *T. microcarpa*.

Flowers distinctly stalked; filaments subulate, scarcely united below.

2. *T. floridana*.

1. SMALL-FRUITED THATCH PALM—*Thrinax microcarpa* Sargent*Thrinax keyensis* Sargent*Thrinax ponceana* O. F. Cook. *Thrinax bahamensis* O. F. Cook

This palm occurs in southern Florida, throughout the Bahamas, and in Porto Rico, growing on limestone rocks, preferably where there is no loose soil at all, but sometimes in sand, and attains a maximum height of 10 or 12 meters, with a trunk up to 2.5 dm. in diameter; it is usually much smaller, however, and is often seen fruiting when only 2 or 3 meters high.

The leaf-blades are 1.5 meters in diameter, or less, sometimes a trifle longer than wide, and they are deeply cleft into many narrow segments; they are light green and somewhat shining on the upper surface, and bluish green to silvery-white on the under side, and when young, white-woolly; the leaf-stalks are usually as long as the blades, or longer, slender, 1 to 2.5 cm. wide; the ligule is blunt-pointed. The panicles of very small, white flowers are borne among the leaves and are usually as long as the leaves, or longer; the flowers are borne on very short, disk-like pedicels on the ultimate slender, smooth branchlets of the panicle, the perianth-segments 2 to 3 mm. long, the filaments nearly triangular. The white or greenish white drupes vary from 4 to 6 mm. in diameter.

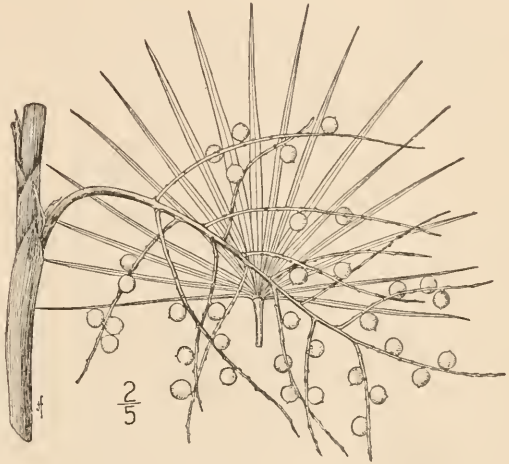


FIG. 99. — Small-fruited Thatch Palm.

The leaves are used in the West Indies for thatching and for hat-making. The tree is planted in southern Florida for ornament. Its wood is soft and spongy, the hard rind 12 mm. thick or less, the specific gravity about 0.60; it is used for piles and wharfs.

2. LARGE-FRUITED THATCH PALM—*Thrinax floridana* Sargent

This palm inhabits southern Florida, growing on limestone rocks and in sand, and also occurs on Cat Cay, Bahamas, just across the Gulf Stream from Cape Florida. A similar, if not identical species, grows in Cuba. It is closely related to the Jamaican *T. parviflora* Swartz.

The trunk attains a maximum height of about 10 meters, with a diameter of about 1.5 dm. The leaves are 1.5 meters in diameter or less, silvery white beneath when young, but becoming pale green when mature, deeply cleft into many long-



FIG. 100. — Large-fruited Thatch Palm.

to 9 mm. in diameter, the seed brown and shining, the basal cavity large.

II. SILVER THATCH PALM

GENUS **COCCOTHRINAX** SARGENT

Species **Coccothrinax argentea** (Loddiges) Sargent

Thrinax argentea Loddiges. *Thrinax parviflora* Garberi Chapman

Coccothrinax Garberi Sargent. *Coccothrinax jucunda* Sargent



HE genus *Coccothrinax* (Greek, berry thrinax, referring to the fruit, which outwardly resembles a berry) includes several species, natives of southern Florida and the West Indies. It is distinguished readily from *Thrinax* by this pulpy fruit, which is black when ripe, and by the seed, which has several channels on its surface; the flowers are very similar to those of *Thrinax*.

Coccothrinax argentea, sometimes called Silver-top or Bay-top palmetto, attains a height of 10 meters, with a trunk 1.5 to 2 dm. in diameter; it is usually much smaller, however, and sometimes makes hardly any trunk at all, the leaves seeming to rise in a tuft from the ground. The leaves are nearly orbicular, 2 to 7 dm. broad, sometimes a little longer than broad, palmately cleft to be-

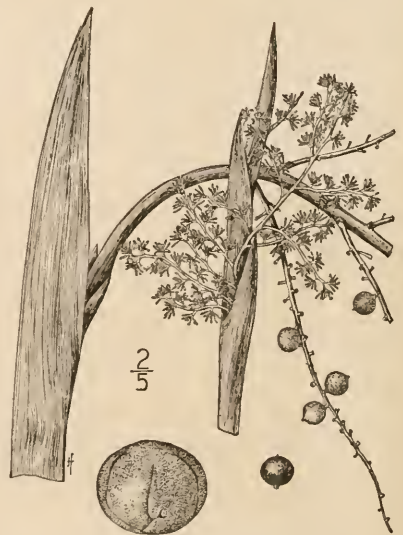


FIG. 101. — Silver Thatch Palm.

pointed segments 2.5 cm. wide or less, which have a prominent yellowish midrib and thickened margins, and are 2-cleft at the end; their orange-colored ligules are 1 to 2 cm. long, and pointed; the leaf-stalks are about as long as the blades, broadened at the base to 5 to 7 cm. wide. The panicle of small white flowers is often 1 meter long, its branches yellowish green; the flowers are distinctly stalked, the stalks about 3 mm. long, slender; the fruits are spherical, white, 6

yond the middle into numerous narrowly lanceolate acuminate segments; they are yellow-green and shining on the upper side, silvery-white beneath, at least when young; their stalks are slender and about as long as the blades, expanded below into fibrous sheaths which remain attached to the trunk after the leaves have fallen away; the large panicles of flowers are short-stalked and borne among the leaves, usually shorter than the leaf-stalks, their branches more or less flattened, their spathes membranous; the flower-stalks are from 1 to 3 mm. long, considerably thickened in fruit. The small white flowers are perfect, with a cup-shaped, 6-lobed perianth, usually 9 stamens with subulate filaments, and a 1-celled ovary. The fruit is black, globose, 12 mm. in diameter, or less; the nearly globular seed is brownish.

It is also known as Brittle thatch; its wood is soft with a thin, hard rind.

Its leaves are extensively used in the Bahamas, being split into narrow bands and these woven into baskets, ropes and mats, the fiber being strong and durable.



FIG. 102. — Silver Thatch, Culebra, Porto Rico.

III. THE PALMETTO

GENUS **SABAL** ADANSONSpecies **Sabal Palmetto** (Walter) Roemer and Schultes*Corypha Palmetto* Walter. *Chameroops Palmetto* Michaux*Inodes Palmetto* O. F. Cook. *Inodes Schwarzii* O. F. Cook

SABAL consists of five or more closely related species, natives of the southern United States, Bermuda, the West Indies, Mexico, and northern South America; they are readily known by the fiber-like threads which separate and droop from the margins of the leaf-segments, the leaves being palmately cleft with a short leaf-axis, which gradually tapers into the blade, and by the clusters of round, black globose fruits.

Sabal Palmetto grows in dry or wet situations from eastern North Carolina to



FIG. 103. — Palmetto.

Florida, throughout the Bahamas and on Cuba; its habitat varies, indeed, from sand-dunes to swamps, sometimes even in flowing water, but it is largest and most abundant on river-banks. The trunk attains a maximum height of about 20 meters with a diameter up to 7 decimeters, but it often flowers freely in southern Florida when not more than 4 meters high. The leaves are 2.5 meters broad, or less, often rather wider than long, their numerous narrow segments 2-cleft at the apex and more or less drooping, rather dull green; the leaf-stalks are stout, often as long as the blades, concave on the upper side, with sharp edges. The numerous small, perfect, nearly stalkless flowers are

spicate on the ultimate divisions of the spreading or drooping panicles, which are borne among the leaves and either shorter or longer than them; the main branches of the panicles are subtended by tubular bracts and flattened; the cup-shaped calyx is unequally 3-lobed, its lobes obtuse, about 1 mm. long; the 3 nearly white petals are oblong or oblong-lanceolate, 5 to 6 mm. long, slightly united at the base; the 6 stamens are about as long as the petals and united by the broadened bases of the subulate filaments; the ovary is 3-celled, the style 3-angled, the stigma truncate. The fruits are small, round black drupes, 6 to 12 mm. in diameter, with thin, sweetish pulp enclosing the depressed-globose brown smooth hard shining seed.

The wood of the Palmetto is soft and spongy; it is largely used for piles and other construction under water and made into canes. The terminal buds of the tree are boiled and eaten like cabbage, and the common name Cabbage palmetto



FIG. 104. — Palmetto, Charleston, South Carolina.

is applied to it in the south; the leaves are largely used in making hats, baskets, and mats, and are also employed for thatching. This palm is much planted for ornament within the regions of its natural growth. It is called Pond thatch and Pond top in the Bahamas; it exudes a resin when wounded.

The type of the genus *Sabal* is *S. glabra* (Miller) Sargent, a species with a horizontal underground stem growing from South Carolina to Florida and Louisiana. *S. Etonia* Swingle, of Florida, also has a subterranean stem. A Palmetto occurs in southern Texas, about the mouth of the Rio Grande, which is supposed to be specifically distinct from *S. Palmetto* of the Atlantic coast and has been named *Inodes texana* by Mr. O. F. Cook, and has been erroneously called *Sabal mexicana*; its fruit is described as often 2-lobed or 3-lobed, a character rarely seen in *S. Palmetto*, and it is also larger than that usually produced by the eastern tree, but the fruit of *S. Palmetto* varies greatly in size. The trees of Cuba and Porto Rico,

which have been supposed to be different from *S. Palmetto*, resemble it very closely; *Sabal Blackburniana*, Glazebrook, endemic in Bermuda, and other species of Cuba, Haiti and Jamaica are clearly different, however.

IV. DESERT PALM

GENUS **NEOWASHINGTONIA** SUDWORTH

Species **Neowashingtonia robusta** (Wendland) Britton

Washingtonia robusta Wendland

Neowashingtonia filamentosa Sudworth, not *Washingtonia filamentosa* Wendland



THREE species of Desert Palms of this genus are known, natives of southern California, Lower California, and western Sonora. They are closely related to each other but appear to be different. They have palmately cleft leaves, the margins of the leaf-segments separating into drooping fibers, as in the Palmetto, which they were first taken to be and which they resemble, but their leaf-stalks are armed with stout short spine-like teeth. The genus is named in honor of George Washington, and was first called *Washingtonia*, but inasmuch as other plants had previously been described under this name, it has been modified into *Neowashingtonia*; the type of the genus is *Neowashingtonia filamentosa*, from northern Lower California, a species which does not stand cultivation as well as the one here described.

Neowashingtonia robusta occurs in moist oases and cañons in the desert regions of southern California, occasionally forming large groves; its reddish brown trunk sometimes becomes a meter in diameter and 25 meters high. The dark green leaves are 2 meters in diameter or less, deeply cleft into numerous linear-lanceolate segments, which are again cleft at the apex; their marginal fibers are usually numerous; the leaf-stalk is as long as the blade or shorter, heavily armed with stout, straight, and curved teeth sometimes 2 cm. long, and its base is much broadened; when wilting the leaves hang down and remain thus attached to the plant for a long period and in large numbers, giving it a curious and characteristic aspect. The large stalked panicles of flowers are axillary to the upper leaves and often 3 or 4 meters long; the fragrant flowers are perfect, borne on short, stout stalks; the tubular calyx is slightly lobed, the corolla funnellform, its tube about as long as the 3 lanceolate lobes; the 6 stamens have separate filaments borne on the corolla-tube; the ovary is 3-celled and 3-lobed, surmounted by 3 slender styles. The edible fruit is a nearly spherical black drupe about 8 mm. long, with thin, sweetish flesh enclosing the ovoid seed, which has a nearly flat base.

This elegant palm is much planted for ornament in California and Florida and has been introduced into southern Europe; it grows rapidly and its large leaves afford much shade. Its wood is soft and spongy, with a specific gravity of about 0.50. The tree is also called Fan-leaf palm, Washington palm, California fan-palm, and Wild date.



FIG. 105. — Desert Palm, southern California.

V. SAW PALMETTO

GENUS **SERENOA** HOOKERSpecies **Serenoa serrulata** (Michaux) Hooker*Chamærops serrulata* Michaux

ERENOA, named in honor of Sereno Watson, long curator of the Gray Herbarium of Harvard University, contains only one species, a characteristic little palm which inhabits dry soil from North Carolina to Florida and Texas, extending northward into Arkansas. It only becomes a tree in its extreme southern range in peninsular Florida, sometimes attaining there a height of 6 meters, its trunk erect or inclined; great areas of



FIG. 106. — Saw Palmetto, southern Florida.

pine-lands are covered with it further north, where its stems are almost invariably underground, often 3 or 4 meters long, and send up the tuft of leaves from the end.

The leaves are deeply palmately cleft into numerous segments 1 to 2 cm. wide, which are again 2-cleft; they vary from 3 to 7 dm. broad; the ligule is small and thin, the leaf-stalk usually longer than the blade, convex on one side and nearly flat on the other, 1.5 cm. wide or less, its margins armed with numerous short,

spine-like teeth placed close together, and it expands below into a fibrous sheath. The panicles are axillary, shorter than the leaves, its numerous branches angled and velvety; the white stalkless flowers are very numerous and fragrant; the calyx is 3-lobed, cup-like, and about 1 mm. long; the oblong petals are concave, 2-keeled on the inner side, and slightly united at the base, 3 or 4 mm. long; the 6 stamens are rather shorter than the petals, their filaments slender; the ovary is composed of 3 carpels, separate at the base but united above. The fruit is an oblong smooth black drupe, 15 to 18 mm. long, containing a smooth oblong, shining seed enclosed in a fibrous layer.

The wood is rather hard for a palm, red-brown, and rich in tannin, which is extracted in the form of a thick liquid and shipped to northern tanneries; a coarse fiber is also extracted from the trunk. The fruit is valued as a fattening food for domestic animals and a fluid extract made from it is used for medicinal purposes; the leafy tops are cut off and shipped north during winter for decoration.

VI. SAW CABBAGE PALM

GENUS **PAUROTIS** O. F. COOK

Species ***Paurotis Wrightii*** (Grisebach and Wendland) Britton

Copernicia Wrightii Grisebach and Wendland, 1866

Serenoa arborescens Sargent, 1899. *Paurotis androsana* O. F. Cook, 1902



PAUROTIS is a monotypic genus, inhabiting swamps and hammocks along the Chokoloskee River southwestern Florida, Andros island, Bahamas, where it is called Spanish-top, and is frequent in Cuba.

This palm has a slender, erect, or inclined trunk up to 15 meters high and 1.5 dm. thick, and often grows in clumps. The light green leaves are very deeply palmately cleft into numerous linear segments, which are 1 to 2 cm. wide, each segment again cleft one third its length, or less; the dark brown leaf-stalks are about as long as the blades, concave on the upper side, their margins armed with stout curved spine-like teeth; the leaf-sheaths are fibrous and persistent, clothing the trunk for some distance below the living foliage. The small, perfect flowers are stalkless and very numerous in flat-stalked, elongated panicles borne among the leaves, and these are subtended by several linear brown-edged spathes; the branchlets of the panicle are usually hairy; the calyx is minute and 3-lobed, the corolla deeply 3-parted, yellowish green, its segments oblong-ovate, acute, about 1 mm. long; the 6 stamens have nearly triangular filaments and are a trifle shorter than the corolla. The fruits are black globose drupes about 8 mm. in diameter, the subglobose brown seed somewhat flattened at the base.

The generic name is Greek. The leaves are bright white beneath when young, and are used for making hats on Andros island.



FIG. 107. — Saw Cabbage Palm, Cuba.

VII. ROYAL PALM

GENUS **ROYSTONEA** O. F. COOK

Species **Roystonea regia** (Humboldt, Bonpland and Kunth) O. F. Cook

Oreodoxa regia Humboldt, Bonpland and Kunth



ROYAL palms are among the most characteristic trees of Cuba and Porto Rico, and very abundant on those islands. The tree of Porto Rico differs very slightly from that of Cuba and has been described by Mr. O. F. Cook as a distinct species (*Roystonea borinquena*) but the differences are so insignificant as to make their specific distinction doubtful. The trees also grow in southern Florida, near Miami, and on both the eastern and western sides of the Everglades, and Mr. Cook has proposed that these be known as *Roystonea floridana*, but they do not differ in the least from the Cuban generic type, *Roystonea regia*, the "Palma real." The generic name is in honor of General Roy Stone of the United States army.

The trunk sometimes reaches a height of 30 meters, perhaps even more, but usually does not exceed 20 or 25 meters with a diameter of 6 dm. or less; it is strictly erect, gray in color, tapering slightly upward from the rather abruptly enlarged base or often somewhat bulging at or about the middle. The numerous pinnate leaves are 3 to 5 meters long, with many linear-lanceolate, long-pointed segments 9 to 10 dm. long, those near the base of the leaf the largest, sometimes 4 cm. wide; these are dark green and somewhat drooping; the leaf-stalks are convex beneath, nearly flat on the upper side, and expand at the base into long broad bright green sheaths, each of which leaves a ring-like scar on the trunk as it falls away. The monœcious flowers are in large nodding stalked panicles at the bases of the leaf-sheaths; the branches of the panicle are somewhat angled; the flowers are stalkless on the slender ultimate appressed branches of the panicle; the staminate ones have a very small calyx with 3 ovate lobes, much shorter than the 3 leathery white petals, which are about 6 mm. long, and from 6 to 12 stamens, with slender filaments; the pistillate flowers are smaller than the staminate ones, their 3 petals united to the middle, and have 6 short sterile stamens, an oblique, nearly round ovary, and a 3-lobed stigma, which becomes nearly basal on the ripening fruit. The fruit is blue, sessile, oblong, about 12 mm. long and 8 mm. thick, the exocarp thin, covering a fibrous brown layer which encloses the oblong brown seed; the sharply 3-lobed calyx is persistent at the base of the fruit.

The Royal palm is one of the most elegant of all palms, and is much planted for ornament in the tropics; in Cuba, where it forms forests, sometimes nearly to the exclusion of other trees, its wood is used for all sorts of construction, its leaves for thatching, and its fruit for hog-food; canes are made from the hard rind of the trunk, which encloses the much softer light brown wood of its interior. The broad leaf-sheath is used by the Cubans to encase tobacco for shipment from the plantations, also for the sides and partitions of their huts, which sometimes are

covered by clapboards made of sections of the hard outer rind of the trunk, the specific gravity of which is about 0.80; that of the soft inner wood is about 0.21.



FIG. 108. — Royal Palm, Cuba.

VIII. HOG CABBAGE PALM

GENUS **PSEUDOPHOENIX** WENDLANDSpecies **Pseudophoenix Sargenti** Wendland*Cyclospathe Northropi* O. F. Cook

HIS palm grows abundantly on many of the Bahama islands, intermixed with hardwood-trees and shrubs in the coppices, and also occurs on Elliott's Key and Key Largo, southern Florida. The genus *Pseudophoenix* (Greek, false *Phoenix*), is monotypic, only this one species being known, which is also known as Sargent's palm.



FIG. 109. — Hog Cabbage Palm, Whale Cay, Bahamas.

The trunk is sometimes 8 meters high, usually lower, and from 1.5 to 3 dm. in diameter; it usually bulges somewhat above the base and the ring-like scars of fallen leaf-bases are prominent and close together. The leaves are often 1.5 to 2 meters long, spreading or the youngest erect, pinnate with very numerous irregularly clustered firm leaflets, which are linear-lanceolate, gradually long-pointed, 0.8 to 2.5 cm. wide, dark green on the upper side, pale green on the lower, and those at or about the middle of the leaf are the longest; the leaf-stalk is very stout, much shorter than the pinnate part, expanded at the base into a broad sheath, convex and glaucous on the under side, concave or nearly flat on the upper; the

leaf-axis is also convex beneath, ridged above, tapering gradually into a slender tip. The axillary drooping inflorescence is a much-branched panicle, shorter than the leaves, its stalk and zigzag branches stiff and flattened; the flowers are numerous; the lower part of the inflorescence bears one or two rings or collars and is subtended by several thick stiff partly hollow narrow spathes, which are very sharp-edged and brown scaly on the edges. The small calyx has 3 sharp lobes; there are 3 yellowish oblong, bluntish, spreading, persistent petals, and six stamens. The young fruit is globose-ovoid, blunt, about 3 mm. long, borne on a stalk 3 to 4 mm. long, which is jointed at the base; the mature fruit is 2-lobed, or more commonly 3-lobed, rather fleshy, scarlet, 2.5 to 3 cm. broad, and about twice as broad as long.

The wood is very soft and is used as food for hogs in the Bahama islands; the terminal bud is boiled and eaten by the negroes. The most abundant growth of this palm known to us is on Whale Cay, one of the Berry islands, north of New Providence, where it covers hillsides and on Little San Salvador. The tree is considerably planted for ornament in southern Florida and on the Bahamas.

IX. COCONUT

GENUS **COCOS** LINNÆUS

Species **Cocos nucifera** Linnæus



THIS, the most useful of all palms, is distributed throughout the tropical regions of both the New World and the Old, growing best in sandy soil along or near the seacoasts. Its original home is not known, but inasmuch as the thirty or forty other species of the genus are natives of tropical America, it is probably of American origin. The tree is spontaneous in all the West Indian islands and in southern Florida.

The trunk becomes 30 meters tall under favorable conditions, with a diameter up to 6 or 7 dm., usually much enlarged at the base; it is normally erect, but is often seen variously bent by hurricane winds; the bright green, pinnately divided leaves are from 3 to 6 meters in length, and from 0.8 to 1.5 meters broad, the numerous linear-lanceolate segments 3.5 to 5 cm. wide, with prominent mid-veins; the leaf-stalk is very stout, much shorter than the blade; the leaf-axis is convex on the under side, ridged on the upper, the leaf-sheath very broad and clasping. The panicles of flowers are borne among the leaves on stout stalks, at length drooping from the weight of the heavy fruit, and are from 1 to 2 meters long; the yellowish white flowers are monœcious, the staminate ones borne toward the end of the panicle are about 1 cm. long, the pistillate larger, and borne mostly on the basal branches of the panicle; the staminate ones have 3 small acute sepals, 3 oblong acute petals, 6 stamens with filiform filaments and a rudimentary ovary or none; the pistillate flowers are ovoid, with 3 leathery, erect sepals, 3 leathery petals shorter than the sepals, and a 3-celled ovary narrowed into a short style, the stigma

subulate. The fruit is large, smooth, 3-angled, often 3 dm. long, with a thick, fibrous husk enclosing the oblong bony hollow nut, which has 3 orifices near the end and is lined with the sweet white endosperm and filled with a sweet limpid juice, much prized as a delicious drink.

This palm is the most important member of its family, at least from an economical standpoint, its useful applications being remarkably numerous. The ripe fruit is the popular coconut of commerce, used as a staple food in all the tropics and as a delicacy in temperate regions, to which the preserved dried flesh in the form of desiccated coconut is also sent and consumed in large quantities as a basis



FIG. 110. — Coconut, Key West, Florida.

for various confections. The “milk” of the ripe fruit is very nutritious as well as delicious, while the watery contents of the younger fruit is one of the most wholesome and delicious drinks obtainable in the tropics. The dried flesh, freed of the hard covering, is a staple commercial product under the name of copra, from which a thick bland oil is expressed. In the tropics coconut oil is an important article of food, it is also the base for fine soaps; the residuum, after the oil is expressed, is a valuable food for cattle. The fibrous husk, under the name of coir fiber, obtained from the unripe fruit, is the basis of an important industry which furnishes a very important coarse fiber, largely used in the manufacture of

mats and ropes. The sweet sap, which flows freely from the young inflorescence when wounded, is collected and evaporated into a crude sugar for local consumption, especially in the East Indian islands. The wood is used locally in construction work and also made into canes and other trinkets. The hard bony shell of the fruit is made into various utensils for local use. Writing-pens, brooms, and other useful objects are made out of the stiff, fibrovascular tissue of the leaf-stalk. The leaves are also used for thatching. A beautiful transparent resin exudes from the trunk, or the husk of the fruit, when wounded.

THE DRACÆNA FAMILY

DRACÆNACEÆ Link



HIS family consists of 10 or 12 genera, with about 115 species of shrubby or tree-like plants, with a woody stem sometimes sparingly branched, occurring in the warmer regions of both hemispheres. They have little economic value; some of the *Yuccas* yield an inferior fiber and edible fruits of very poor quality, and the roots of some are also used as soap. The Dragon tree, *Dracæna Draco*, of the Canary islands, a large and peculiar tree, is said to have been of great importance to the ancient Egyptians, as the red resinous exudation is supposed to have been used by them in the process of mummifying their dead; under the name of Dragon's blood it was used medicinally in the form of plasters and other applications. The Dragon's blood of the present time, however, is derived from some East Indian palms. Many species of *Dracæna* are great favorites in our conservatories, on account of their beautiful and often gorgeously colored foliage.

The *Dracænaceæ* have very numerous alternate, long, narrow, firm, stiff leaves, often with thread-like filaments on the margin, sometimes finely toothed. The flowers are in racemes or panicles, on terminal scapes or scape-like stems; their perianth, consisting of 6 quite similar divisions, is usually white; stamens 6, their filaments distinct, but sometimes partially joined to the perianth; anthers 2-celled. The pistil consists of 3 united carpels; the ovary is superior, 1- to 3-celled; ovules 2 to many in each cavity; styles united, sometimes very short or obsolete, usually evident on the fruit, which is a dehiscent capsule, or indehiscent and berry-like.

Our arborescent genera are:

Divisions of the perianth distinct or but very slightly united at the base;

stamens slightly attached to the base of perianth.

Perianth-segments thickened, mostly inflexed; style wanting.

Perianth-segments thin and petaloid, spreading at night; style present.

Divisions of the perianth united into a short tube at the base; stamens inserted on its throat.

1. *Clistoyucca*.

2. *Yucca*.

3. *Samuela*.

I. JOSHUA TREE

GENUS **CLISTOYUCCA** [ENGELMANN] TRELEASESpecies **Clistoyucca arborescens** (Torrey) Trelease*Yucca Draconis arborescens* Torrey*Yucca brevifolia* Engelman, not Schott. *Yucca arborescens* Trelease

THIS interesting tree occurs in the Mojave desert region of southern California, eastward into Arizona and southwestern Utah, attaining a height of 12 meters, with a trunk diameter of 9 dm., and is also known as Joshu yucca, Tree yucca, Yucca cactus, and The joshua.



FIG. 111. — Joshua Tree.

The trunk is thickened near the ground, contracted just above, and with the exception of very old trees is densely clothed to the base by the persistent dead leaves. The rind at the base of the trunk is 2.5 to 4 cm. thick, deeply fissured into narrow thick elongated plates of a grayish color. The branches usually appear after the plant has first flowered, and fork repeatedly after further flowering, forming a broad open head. The leaves are densely clustered at the ends of the branches, light green, somewhat glaucous, 1.25 to 3 dm. long, 6 to 12 mm. wide, abruptly narrowed just above the shining red-brown base, concave above, flattened toward the base, the tip dark reddish brown, stiff, tapering and sharp, the margin thin, yellowish, finely toothed. The flowers appear in spring from a large hairy ovoid bud, in hairy densely flowered sessile panicles about 4 dm. long; the upper bracts are white and dryish; the flowers are erect, globose or oblong, 2.5 to 5 cm. long, greenish

white and unpleasantly odorous; the perianth-segments are keeled on the back, thickened above the middle, the tip inflexed and much thickened; those of the outer series are broader and thicker than those of the inner, oblanceolate to lanceolate; stamens about one half the length of the perianth, their filaments nearly free, thickened, and usually curved outwardly above; anthers arrow-shaped; ovary sessile, ovoid, tapering upward into the 6-lobed stigma. The fruit is somewhat drooping when ripe, oblong or ovoid-oblong, 5 to 10 cm. long, somewhat 3-lobed, and sharp-pointed; it is light brown or yellow-brown, indehiscent, dry, its spongy wall about 1 cm. thick, enclosing the many black seeds; these are roundish-triangular, 10 to 12 mm. long, 1.5 mm. thick, with a narrow margin.

The wood is soft, very porous, light brown or nearly white; its specific gravity is about 0.37. It has been used for paper pulp, but is undesirable for lumber and worked with great difficulty; it is also cut into strips and used for packing purposes. The Indians grind the seed into meal and bake it.

The genus contains but one species; the name is Greek, signifying hidden Yucca, referring to the nearly closed flowers.

II. THE YUCCAS

YUCCA [DILLENIIUS] LINNÆUS



THIS genus consists of about 28 species of peculiar plants varying from a low, almost stemless form, like the Beargrass or Adam's needle, *Yucca filamentosa*, to tall, single-shafted trees fully 15 meters high. Their branches, if any, are sparingly produced. The long, narrow sword-like leaves radiate in all directions, the dead ones remaining attached to the stem or branches for many years. They occur in the temperate portions of North America from Maryland to South Dakota, south and westward to Florida, Mexico and Central America; also in the West Indies. They are commonly called Spanish bayonet or Spanish dagger and many of the species are planted for ornament, their large clustered flowers being very conspicuous.

The leaves are alternate, linear-lanceolate, firm, usually thickened toward the base and concave above the middle. The flowers are in large, many-flowered terminal racemes or panicles, more or less odorous, nearly white, and drooping; the perianth is subglobose or bell-shaped, its divisions distinct or but very slightly united at the base; stamens 6, hypogynous, in 2 series, their filaments free, enlarged above and curved outward, shorter than the perianth; anthers short, arrow-shaped, 2-celled; the ovary is usually sessile, smooth, and green, 3-celled or imperfectly 6-celled, rarely but 1-celled; style oblong or swollen; stigma unequally 6-lobed; ovules numerous in each cell. The fruit is a dehiscent capsule, or indehiscent and berry-like; the seeds are numerous, more or less triangular, flattish, and usually black.

These plants are of no important economic use. The soft spongy wood has been made into paper pulp and is also used to some extent for construction. The fleshy fruits of many species are edible and are also fermented into an alcoholic beverage. The leaf fibers are used in the manufacture of baskets and mats, while the extracted fiber of the leaves is also used, but only to a limited extent. The inflorescence of some of the species is gathered by the Mexicans and used as fodder for domestic animals.

The generic name is adopted from the Carib name of one of the species, the type being *Yucca aloifolia* Linnaeus.

Of probably 18 species occurring in our area the following are arborescent:

Fruit dehiscent; southwestern tree.

Fruit indehiscent.

Seeds thin, flat, narrowly margined; fruit soon becoming dry; southwestern tree.

Seeds thick or quite marginless; fruit drooping, fleshy, edible.

Ovary stalked; fruit coreless, the pulp purple; leaf margin horny, sharply toothed; southeastern tree.

Ovary not stalked; core of fruit papery, the pulp greenish or yellowish white; leaves concave, more or less filiferous.

Leaf margins slightly toothed; tree of Texas and Mexico.

Leaf margins not toothed.

Leaf margin thin and flexible, the threads very firm; peduncle hairy.

Leaf margin thick and stiff, the threads coarse; peduncle not hairy.

Style elongated; Texas.

Style short; Arizona.

1. *Y. elata*.

2. *Y. gloriosa*.

3. *Y. aloijolia*.

4. *Y. Treculcana*.

5. *Y. Schottii*.

6. *Y. Torreyi*.

7. *Y. mohavensis*.

1. SOUTHERN YUCCA — *Yucca elata* Engelm

Yucca radiosa (Engelm) Trelease. *Yucca angustifolia radiosa* Engelm

Yucca constricta Baker, also Sargent, not Buckley

A simple or sparingly branched tree of the high, dry plains of southwestern Texas to southern Arizona and adjacent Mexico. Its maximum height is 7 meters. It is also called Spanish bayonet and Spanish dagger.



FIG. 112. — Southern Yucca.

The trunk is usually simple and covered nearly to the ground by the persistent dead leaves. The rind, which is sometimes exposed at the very base of the trunk, is about 6 mm. thick and broken into thin irregular scales of a dark brown color. The leaves are yellowish green, rather stiff and diverging, linear, 5 to 7.5 dm. long; the clasping base is 3 to 6 cm. wide, thin, whitish, and is abruptly narrowed to the gradually tapering blade, which is about 7 mm. broad at the middle, thin and flat above, slightly rounded beneath, stiff, brownish tipped, the margins entire, thin, and white, splitting into very

long slender threads. The flowers, opening from May to July, are in branched panicles 1.2 to 1.8 meters long, the smooth stalks of which are about the same

length; the bracts are thin and white, the flowers are stalked, drooping, their perianth bell-shaped, 8 to 12 cm. broad, thin and white; the segments are but slightly united at the base, ovate or ovate-lanceolate, narrowed into a bluntish tip and hairy at the apex, the outer series merely sharp-pointed and about half the width of the inner ones; the stamens are about as long as the pistil; the ovary is sessile, greenish, abruptly narrowed into an oblong white style about 8 mm. long terminated by the white-lobed stigma. The fruit is short-stalked and erect, oblong, 3.5 to 5 cm. long, about three fourths as thick, smooth, rarely if at all constricted, blunt at the base, tipped with the short style, slightly 3-lobed with convex ridges. The outer covering is thin, light brown, and woody; seeds numerous, often semicircular, 12 to 16 mm. long, thin and smooth with a brittle margin. When mature, the fruit splits into three 2-toothed carpels, releasing the seeds.

The wood is very porous, brown or yellowish; its specific gravity is about 0.45.

The young inflorescence is collected just before opening, and eaten by the Mexicans and Indians.

2. SPANISH BAYONET — *Yucca gloriosa* Linnaeus

An inhabitant of the coastal region from North Carolina to northeastern Florida, rarely met in a wild state but frequently cultivated in the south for ornament, where it has become spontaneous, especially in some of the Gulf States, reaching a maximum height of 5 meters, with a trunk diameter of 1.5 dm.; usually, however, it is much smaller and at times quite stemless. It is also known as Spanish dagger.

The trunk is stout, usually simple, rarely branched; branches, when present, very short and bearing relatively few leaves. The rind at the base of the trunk is thick, rather smooth, and light gray. The leaves are dull green, often somewhat glaucous when young, nearly linear, 3 to 5 dm. long; their broad base is rounded to the narrow blade, which is usually widest near the middle, dull green, rarely glaucous, stiff and dark reddish at the apex, with a few teeth or a few short fibers on the brownish margin. The flowers usually appear in autumn, rarely as early as July; they are usually in long-stalked, upright panicles 6 to 12 dm. long, sometimes 4 dm. thick, the lanceolate bracts white, sharp-pointed, 1 to

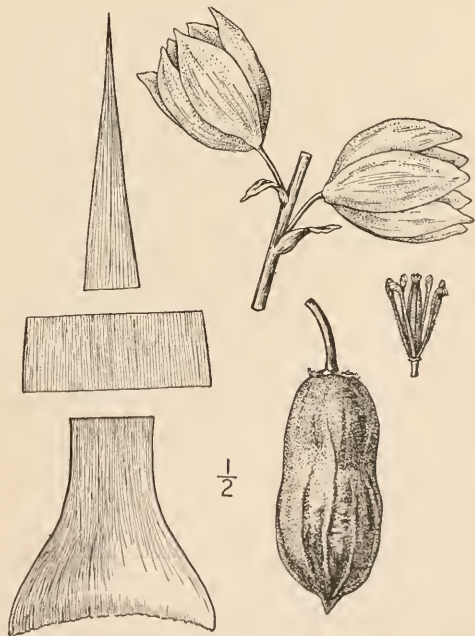


FIG. 113. — Spanish Bayonet.

10 cm. long; the flowers are long-stalked, spreading or pendulous, their perianth 8 to 10 cm. broad, the segments lanceolate or oblong-lanceolate, sharp-pointed, 4 to 5 cm. long, slightly united at base, creamy white with more or less violet and purple on the outer surface; stamens about as long as the ovary, their filaments rather slender, only slightly bent outward and a little hairy; anthers notched at the apex; ovary sessile or very nearly so, greenish, narrowed upward into the oblong sometimes 3-lobed style. The fruit is an indehiscent leathery capsule, nodding, nearly oblong or obovoid-oblong, 5 to 6 cm. long, 2.5 cm. thick, usually constricted near the middle, prominently 6-ridged, its base rounded, and the apex sharp-pointed. The seeds are black and shining, rounded-triangular, 6 to 7 mm. long, 1.5 mm. thick.

The Spanish bayonet is largely cultivated in warm-temperate and tropical America, and in southern Europe, where several garden varieties are grown.

3. SPANISH DAGGER — *Yucca aloifolia* Linnæus

Limited in the wild state in our area to sandy soils from North Carolina to southern Florida and westward to eastern Louisiana, especially abundant on the sand dunes and islands of the coast, this also occurs in Bermuda, the West Indies, and eastern Mexico, attaining a height of 9 meters, with a trunk diameter of 1.5 dm.



FIG. 114. — Spanish Dagger.

The trunk is usually slightly swollen at the base, erect or inclining, slender, often simple, commonly sparingly branched and frequently suckering from the base. The rind, sometimes exposed near the ground, is thick, rough, and brown, otherwise the trunk is covered with leaf-scars or closely appressed deflexed dead leaves which persist for many years; near the top the living leaves radiate in all directions. The branches are short, erect, and seldom exceed three in number. The leaves are numerous, dark green, smooth,

narrowly linear-oblong, 3 to 9 dm. long, flat, rather thick and stiff, the broad base light colored and abruptly contracted to the narrow blade, which is widest near the middle, a little concave above, tipped with a stiff, sharp, brown point and margined with small, thick teeth. The flowers appear from June to December in conic panicles 3 to 9 dm. long, compact and close to the leaves; the bracts

are thick, and smooth, the pedicels stout, 2.5 to 5 cm. long; the flowers open widely at night; they are 7.5 to 10 cm. across; the perianth is creamy white, often tinged with green or purple, its segments 4 to 6 cm. long, oblong to elliptic, the outer sharp-pointed. The fruit is a short-stalked, drooping, pulpy capsule, narrowly oblong, 7 to 10 cm. long, somewhat 6-sided, rounded at the base, narrowed and beaked at the apex, with a fleshy, deep purple pulp which is bitterish but sweet, and is eaten by the negroes at the south, who call them "Bananas." The seeds are rounded or oval, often sharp-pointed, about 6 mm. long, 1.5 mm. thick, black and shining.

The Spanish dagger is much planted for hedges surrounding tropical gardens; it is often seen in conservatories and is known in several cultivated varieties.

4. TEXAN BAYONET — *Yucca Treculeana* Carrière

Occurs from south-central Texas to northeastern Mexico, scattered, or in large groves, reaching a height of 9 meters, with a trunk diameter of 6 dm., but sometimes much smaller and forms very dense thickets. It is also called Spanish dagger.

The trunk is simple or few-branched, the branches being short, stout, and spreading. The rind at the base of the trunks of old trees is about 8 mm. thick, fissured into thick, angular plates and covered with small close scales of a dark reddish brown color. The leaves, which persist for many years, are numerous, bluish green, lanceolate, 9 to 12.5 dm. long, roughish, thick and stiff, somewhat narrowed above the broad clasping, dark red, shining base, widest near the middle, very concave above, armed at the apex with a short, sharp, dark brown spine; the margin is pale, thickened, and soon separates into fine dark-colored fibers. The flowers appear from March to May in short-stalked glabrous bracted panicles 6 to 12 dm. long; the lowest bracts are very large. The flowers are pendent on short, slender pedicels, nearly globular, 5 to 10 cm. broad, white or purplish, the perianth-segments free to the base, thin, ovate-lanceolate, 3 to 5 cm. long, sharp or taper-pointed; the stamens are about as long as the ovary, their filaments hairy, bent outwardly at the top; ovary 3-lobed, tapering to the sessile, deeply lobed stigma. The fruit, ripening in summer, is a stalked and drooping berry-like indehiscent capsule, oblong, slightly 6-sided, grooved or 3-lobed, 7.5 to 10 cm. long, rounded at the base



FIG. 115. — Texan Bayonet.

with but little of the perianth bases remaining, narrowed at the apex into a short tip, reddish brown; flesh juicy, bitterish sweet, and of a rather pleasant flavor, with a thick, papery inner layer surrounding the seeds; these are rounded triangular, about 7 mm. long, about one third as thick, and marginless or slightly margined.

The wood is soft, porous, and light brown; it is seldom used. The fruit is used as food by the Mexicans, who also utilize the rootstock as a soap.

5. SCHOTT'S YUCCA — *Yucca Schottii* Engelm

Yucca macrocarpa Engelm

This rarely attains its maximum height of 6 meters and is found in southern Arizona, especially near Benson and Nogales, and grows also in adjacent Mexico.

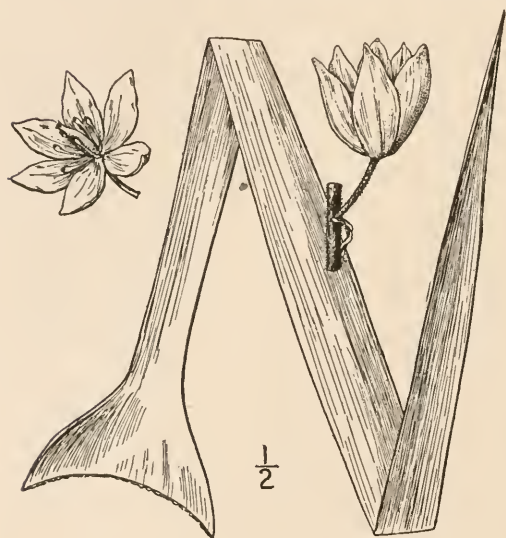


FIG. 116. — Schott's Yucca.

The trunk is usually unbranched and densely clothed with leaves or leaf fragments; branches, if any, few, short, and erect. The rind, sometimes exposed at the base of the trunk, is about 10 mm. thick and roughened by leaf scars. The leaves are thin but stiff, narrowly linear-oblong, 7 to 9 dm. long, and 2 to 4 cm. wide, smooth and bluish green; the upper portion is concave, the apex stiffly sharp-pointed, margins brown, with very few fine threads. The large subglobose flowers, appearing in late summer, are in dense, very hairy or

seldom nearly smooth panicles, on short stalks. The fruit is oblong and relatively large, up to 1 dm. long, black, with thin, edible flesh, when ripe; seeds large, angular, obovate, about 9 mm. long.

SHORT-LEAVED YUCCA — *Yucca brevifolia* Schott

This species occurs in the cañons and hills of the upper Santa Cruz valley, especially in the vicinity of Nogales, Arizona, usually in clusters, and occasionally tree-like and 2 meters tall.

The leaves are smooth, light green, stiffly diverging, 3 to 7.5 dm. long, 6 to 25 mm. wide, thick, somewhat curved; the apex is sharp and stiff-pointed, the margin splitting into numerous thread-like fibers. The flowers are in smooth, rather loose panicles on short stalks, relatively small, with a tapering style. The fruit is berry-like, rather large, its seeds 9 to 12 mm. in diameter.

6. TORREY'S YUCCA — *Yucca Torreyi* Shafer*Yucca macrocarpa* Coville*Yucca baccata macrocarpa* Torrey, not *Yucca macrocarpa* Engelmann

A much-branched tree of the desert reigon from western Texas westward through New Mexico into eastern Arizona, and southward in Chihuahua.

The leaves are yellowish green, 0.5 to 1 meter long, 4 cm. wide, gradually narrowed above the dark shining base, widest near the middle, rough beneath, sometimes so above, the apex armed with a stout, long, dark-colored spine, the margin thickened and freely separating into coarse grayish threads. The flowers appear in March and April in dense, sessile, or nearly sessile, smooth panicles, the bracts often brownish; perianth 4 cm. long, the segments acute, the outer similar to the inner; stamens shorter than the style, which is somewhat elongated. The fruit is oblong, 7.5 to 10 cm. long, about half as thick, rounded at the base, contracted into a stout projection at the apex; its flesh is sweet and juicy; seeds thin and flat, 6 to 8 mm. long, with a narrow rim.

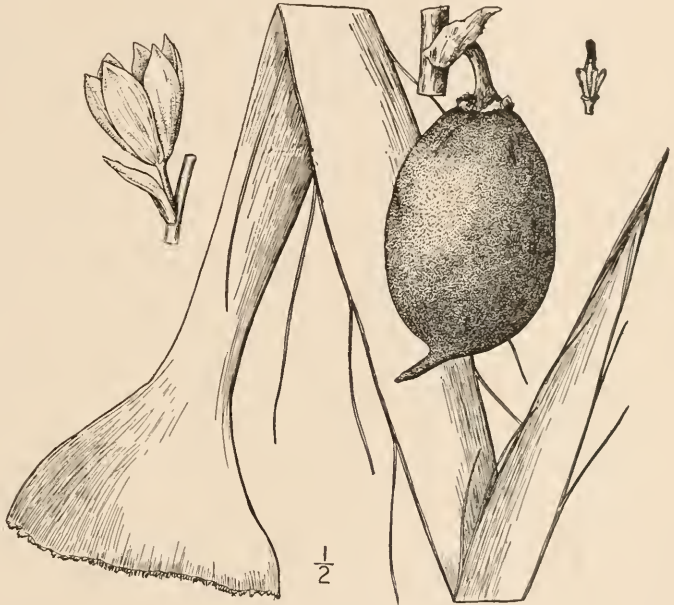


FIG. 117. — Torrey's Yucca.

7. MOHAVE YUCCA — *Yucca mohavensis* Sargent

This tree, like the other arborescent Yuccas, is also called Spanish dagger or Spanish bayonet. In general appearance it is similar to the foregoing species, but its range is very different, occurring in the Mohave desert, in the region from southern Nevada and western Arizona into southern California south of Monterey; also in adjacent Lower California. Its maximum height is 4.5 meters with a trunk diameter of 2 dm.; but it often remains low and quite trunkless.

The trunk is usually simple, rarely having several stout spreading branches. The rind, sometimes exposed at the base of the trunk, is dark brown and roughish. The leaves, which often cover the trunk to the ground, are light green, smooth,

linear-oblong, from 4.5 to 8 dm. long; the base, which is sometimes 1 dm. wide, is thickened, dark red, shining, and abruptly contracted into the blade, which gradually widens to about the middle, where it is about 4 cm. wide and concave, the margins almost touching near the dark-colored, stout, stiff, sharp-pointed

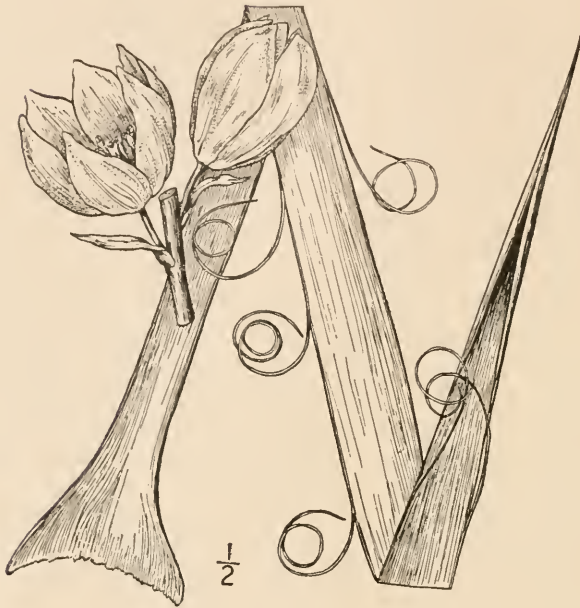


FIG. 118. — Mohave Yucca.

apex; the margins are entire, light brown before separating into many, smooth, long, gray, thick threads. The flowers, appearing from March to May, are in smooth or roughish reddish panicles, which are 3 to 4.5 dm. long and sessile or nearly so; the bracts are green or white; the flowers are erect at first but finally droop, 2.5 to 4 cm. long, their perianth-divisions spreading and slightly united at the base, thickened, somewhat concave and hairy at the apex, the outer series thickened, keeled, narrowed at the base and often purplish tinged; the stamens are as long as the pistil, their fila-

ments somewhat hairy; ovary sessile, somewhat 3-lobed, about 1 cm. long, narrowed above the very short, 3-grooved style. The fruit is drooping, indehiscent and fleshy, yellowish, becoming purplish and finally black, 7.5 to 10 cm. long, nearly one half as thick, more or less constricted above the middle, rounded at the base, abruptly narrowed at the apex into a stout tip, the flesh sweetish and juicy; the seeds are 8 mm. wide, 3 mm. thick, with a narrow border to the rim.

The wood is soft, porous, and light brown; its specific gravity is about 0.27. It is used only by the Indians, who also employ the leaf fibers in their basketry, and for making cordage.

Except by its shorter style, this species differs little from Torrey's Yucca.

III. SIERRA BLANCA YUCCA

GENUS **SAMUELA** TRELEASESpecies **Samuela Faxoniana** Trelease*Yucca macrocarpa* Sargent, not Engelmann*Yucca Faxoniana* Sargent

KNOWN only from the vicinity of Sierra Blanca in western Texas, this Yucca-like plant probably extends into adjacent Mexico. Its maximum height is about 12 meters, with a trunk diameter of 6 dm.

The trunk is usually simple, seldom having a few short branches. The young plants are densely covered with numerous erect or radiating living leaves; later the base is covered by a thatch-like covering of reflexed dead leaves; on old trees the rind is exposed at the base. The rind is about 8 mm. thick, dark reddish brown, and scaly. The leaves are dark green and smooth, linear-oblong, 1 to 1.25 m. long, stiff and firm, abruptly narrowed just above the thickened, shining red clasping base which is often 1.5 dm. broad, widest at or above the middle and slightly concave toward the apex, which is armed with a very sharp, dark tip; the margin separates into grayish threads, which, with the exception of a few coarse fibers near the apex, eventually peel backward and form a persistent tangled mass at the base of the leaf. The flowers, which appear in spring, are in short-stalked, broadly conic loosely-branched panicles with persistent white bracts; they are drooping on long stalks, 5 to 10 cm. across; the perianth is funnellform, of 6 parts, which are broadly lanceolate, sharp-pointed, and curved inwardly at the apex, united at the base into a tube about 8 mm. long, those of the outer series narrower; stamens 6, their filaments shorter than the ovary, club-shaped, hairy, and curved outward; anthers arrow-shaped and horizontal; ovary sessile, narrowly oblong, ridged, yellowish, longer than and narrowed into the slender, grooved style; stigma irregularly 6-lobed. The fruit, which ripens in early summer, is indehiscent, 2.5 to 7.5 cm. long, fleshy, pendent, oblong-ovoid, scarcely angled, beaked at the apex, dark yellow and shining, becoming black, the flesh dryish, bitter and sweet; seeds rounded triangular, flat but thick, about 6 mm. long and half as thick, not margined.



FIG. 119. — Sierra Blanca Yucca.

The wood of the Sierra Blanca yucca is light and porous. The fibrous leaves and the fibers taken from them are used by the Indians like those of the Yuccas.

The genus, of which this species is the type, consists of 2 known species, the other being Mexican. Its name is in honor of Samuel Farlow Trelease, son of the author of the genus.

SUBCLASS DICOTYLEDONES



PLANTS of this subclass have a more complex stem structure than the Monocotyledones, their fibrovascular system being arranged in concentric layers, which are divided into wedge-shaped segments by cellular tissue, called medullary rays, radiating from a central column of similar material, called the pith. The growth of these stems takes place in the cambium, a zone of soft tissue between the wood and bark, by which the stem is enlarged, the annual suspension of growth caused by a decrease of temperature or lack of moisture, producing the concentric bands usually called annual rings, which in our climate can generally be depended upon as representing one year's growth. They are often called Exogens or outside growers.

The leaves are netted-veined. They often have stipules and are frequently compound, and their position upon the stem may be alternate, opposite, or verticillate. The flowers are various in structure and often more complex than those of most Monocotyledones. The embryo has 2 seed-leaves.

This subclass contains by far the greater number of our deciduous-leaved trees, and all of the so-called hard woods are derived from them; it is composed of two series of plants, (1) Choripetalæ, in which the corolla of the flower is either wanting, or the petals are separate from each other, and (2) Gamopetalæ, in which the petals are more or less united, forming a saucer-shaped, urn-shaped, bell-shaped, or more or less tubular corolla; an interesting exception to this structure is found in the Ashes (*Fraxinus*) trees of the Olive Family, in many of which the flowers have no corolla, but other points of structure cause them to be grouped as Gamopetalæ.

THE BEEFWOOD FAMILY

CASUARINACEÆ Lindley



HIS family consists of but one known genus, of which there are probably 25 species of trees or shrubs, inhabitants of the tropics, being especially abundant in the Australian region. They are of no special economic value, except for their wood, and the bark, which is sometimes used for tanning.

The Casuarinaceæ have mere scales in lieu of leaves; these are very small, appressed, or recurved when old, in whorls at the nodes; sometimes they are united into a sheath, the midrib decurrent on the twigs. The flowers are monœcious. The staminate flowers, in cylindric slender terminal spikes, are subtended by imbricated bracts, often with a 2-parted perianth; stamen only 1, the anther large and opening lengthwise. The pistillate flowers are in dense, cone-like clusters, the perianth wanting; ovary 1-celled; style forked, the 2 branches slender; ovules 1 or 2 in a cell. The fruit is a cone-like aggregation of accrescent scales, each subtending a solitary seed with a membranous coat; the embryo is straight, with 2 flat cotyledons, endosperm none.

One species has become naturalized in the extreme southern portion of our area.

BEEFWOOD

GENUS **CASUARINA** FORSTER

Species **Casuarina equisetifolia** Forster



HIS peculiar tropical tree has become naturalized in southern peninsular Florida, and the Keys, and is widely distributed throughout the West Indies and other tropical regions; it is indigenous in tropical Asia and Australasia. Its maximum height, in Florida, is about 20 meters, with a trunk diameter of 1 m. It is reported to attain a height of 45 meters in the Polynesian region, and is variously known as Ironwood, Polynesian ironwood, She oak, and Swamp oak. It is the type of the genus.

The branches are long, slender, and wand-like, the upper erect. The bark is dark brown and slightly furrowed. The twigs are numerous, slender, drooping, angular, and jointed, somewhat resembling the stem of a Horsetail (*Equisetum*). The leaves are appressed and scale-like, recurved on the older branchlets, 6 to 8 in a whorl at each node and 1 to 3 mm. long. The flowers are very small, the



FIG. 120. — Beefwood in Florida.

staminate in terminal slender cylindric spikes 1 to 4 cm. long, the bracts closely imbricated, the anthers exserted; the pistillate flowers are lateral in dense, subglobose spikes, on short branches, 1 to 2 cm. long. The cone-like fruit is globular or oblong, 1 to 2 cm. in diameter, yellowish brown, the scales corky. The fruit is flattish, broadly winged at the top, oval in outline, about 5 mm. long; the wing is very thin and membranous, prominently 1-nerved, pointed at the apex.

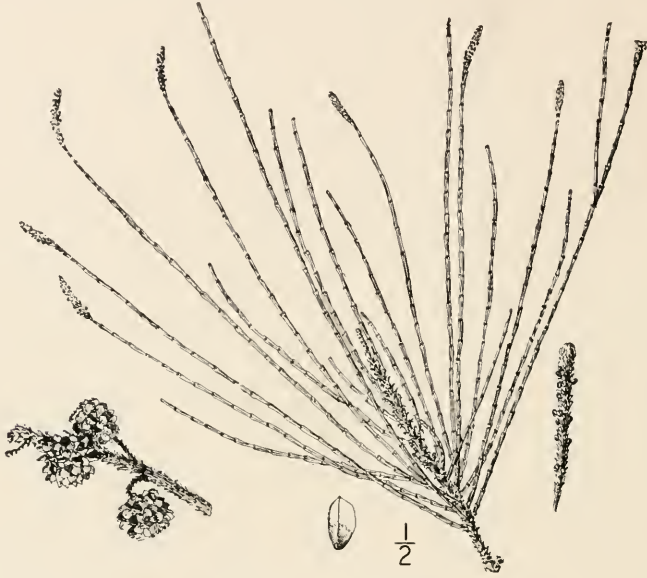


FIG. 121. — Beefwood.

Beefwood is very hard, strong, close-grained, flesh-colored at first, but turns brown with age; its specific gravity is about 0.93. It is greatly valued for fuel, for which purpose it is largely planted along sandy seashores, where it thrives best. It is also used as a shade tree.

The generic name is derived from the zoological name of the Cassowary, on account of the resemblance of the branchlets of some of these trees to the feathers of that bird.

THE WILLOW FAMILY

SALICACEÆ Lindley



WO genera only form this family, including probably 250 species of trees or shrubs of temperate and cold regions, principally of the northern hemisphere, reaching into the arctic regions and to very high altitudes.

Economically the family produces little of importance; the weak soft wood is a favorite source of fine charcoal. The twigs of some of the tougher willows are largely used for baskets and wickerware; the bark of most of them contains a bitter principle, and is sometimes used medicinally; the astringent bark of some is used to a small extent in tanning. The willows are sparingly planted for shade, but more often along water courses for the protection of their banks. The poplars are much planted for shade trees, mainly on account of their rapid growth, and the wood of several species is largely used in the manufacture of paper pulp.

The *Salicaceæ* have deciduous, alternate, simple leaves with or without stipules. The flowers are dioecious, in bracted catkins, each flower being solitary in the axil of a bract; the perianth is represented by a cup-shaped disk or a gland. The staminate flowers consist of 1 or more stamens, their filaments free or united; anthers 2-celled, the sacs opening lengthwise. The pistillate flowers consist of a one-celled ovary subtended by a small disk and composed of 2 or rarely 4 united carpels; stigmas 2 to 4, more or less united, rarely raised on a short style; the ovules are numerous. The fruit is a dehiscent capsule enclosing numerous seeds, each seed being provided with a dense tuft of hairs at the apex; these are long, silky, and usually white.

The genera are:

Bracts of the flowers more or less cut and fringed; disk cup-shaped; winter buds with several scales

1. *Populus*.

Bracts of the flowers entire; disk of 1 or 2 glands; winter buds with but 1 scale

2. *Salix*.

I. THE POPLARS

GENUS **POPULUS** [TOURNEFORT] LINNÆUS



POPULUS, the ancient name of the European poplars, was accepted by Linnæus as the name of the genus which they constitute. Some 27 species of these trees exist, inhabiting the north temperate and subarctic zones. One species occurs only in mountainous regions of southern Lower California, and this is the only American member of the genus known,

additional to those here described. *Populus alba* Linnaeus, of Europe and Asia, is the type species of the genus.

The Poplars are mostly trees of very rapid growth, with straight-grained, easily splitting wood. The bark contains some tannin. The young branches are round or angled, marked by the large leaf scars; the buds are usually resinous, covered with several scales, the lower scales opposite, the upper overlapping. The leaves are alternate and stalked, involute in the bud, entire-margined or variously toothed; their stipules usually fall away as soon as the leaves begin to unfold. The very small, imperfect flowers are borne in long, drooping catkins, which appear in early spring from scaly buds separate from the leaf-buds, before the leaves unfold, the staminate catkins on one tree, pistillate on another, though very rarely both pistillate and staminate occur on the same tree; each scale of the catkin subtends a single flower and is variously cut-lobed or fringed; these scales fall away very early, leaving the cup-shaped, oblique disk supporting the flower; the staminate flowers have several or many stamens with smooth, separate filaments and short, red or purple anthers; the pistillate flowers have a single one-celled ovary containing many ovules, a very short style, and 2, 3, or 4 stigmas, which are dilated or slender and variously lobed or parted. The fruit is a capsule which, when ripe, splits into as many recurved valves as there were stigmas, releasing the very small seeds, which are provided with a tuft of copious soft white hairs; these are widely disseminated by the wind and have given the trees the popular name, Cottonwoods.

Petioles round or channeled, scarcely or not at all flattened laterally.

Leaves densely and persistently white-tomentose beneath, lobed or coarsely toothed; introduced European tree.

1. *P. alba*.

Leaves glabrous or nearly so, when mature, crenate or crenulate; native trees.

Foliage densely tomentose when young; capsules long-pedicelled.

2. *P. heterophylla*.

Foliage not tomentose; fruits short-pedicelled.

Leaves broadly ovate, truncate, or cordate at the base, the petioles and nerves usually pubescent or ciliate.

Ovary tomentose; western tree.

3. *P. trichocarpa*.

Ovary glabrous; northern tree.

4. *P. candicans*.

Leaves ovate to lanceolate, acute or obtuse at the base (cordate in No. 8); petioles glabrous.

Petioles fully one half as long as the blades.

Leaves green on both sides, abruptly acuminate.

5. *P. acuminata*.

Leaves pale or brownish beneath, acute or acuminate.

6. *P. balsamifera*. ✓

Petioles one third as long as the blades or less.

Leaves not cordate.

7. *P. angustifolia*.

Leaves cordate.

8. *P. Tweedyi*.

Petioles strongly flattened laterally.

Leaves broadly deltoid, abruptly acuminate; stigma-lobes dilated.

Bract at the base of the pistillate flower large, dilated.

Pedicels as long as the fruits or longer.

9. *P. Wislizeni*.

Pedicels shorter than the fruits, often very short.

- Californian tree; leaves short-acuminate, truncate or reniform at base. 10. *P. Fremonti*.
- Southwestern tree; leaves mostly long-acuminate, more or less broadly wedge-shaped at base. 11. *P. mexicana*.
- Bract at the base of the pistillate flower small, appressed.
- Young leaves pubescent; fruits nearly sessile; European introduced trees.
- Branches spreading. 12. *P. nigra*.
- Branches erect. 13. *P. italica*.
- Leaves glabrous; capsules slender-pedicelled; native trees.
- Leaves crenulate; pedicels as long as capsules or longer; eastern tree. 14. *P. deltoides*.✓
- Leaves coarsely crenate; pedicels shorter than capsules; western tree. 15. *P. Sargentii*.
- Leaves broadly ovate to suborbicular; stigma-lobes filiform. 16. *P. grandidentata*.✓
- Leaves coarsely sinuate-dentate. 17. *P. tremuloides*.✓
- Leaves crenulate-denticulate to entire-margined.
- Petioles mostly longer than the blades; leaves mostly glandless. 18. *P. cerdiphylla*.
- Petioles about as long as the blades; leaves thick, 2-glandular on the under side at the base of the blade.

1. ABELE — *Populus alba* Linnæus

This tree, known also as White poplar and Silver-leaf poplar, from the white-velvety under surfaces of its leaves, is a native of Europe and Asia, but has been much planted in eastern North America, and, as it suckers very freely, has passed in many localities beyond the limits of cultivation, in yards and along roads, from New Brunswick to Ontario and Virginia. It sometimes becomes 30 meters high, with a trunk a meter or more in diameter. The bark is light gray and nearly smooth, or much roughened, with brown blotches, dark brown and rough or fissured toward the base of old trunks. The young twigs are purplish and white-downy, becoming smooth and gray. The buds are 5 to 6 mm. long, downy, ovoid, pointed. The young leaves are very densely white-velvety, their upper surfaces becoming dark green and smooth; when mature they are 6 to 10 cm. long, lobed or irregularly coarsely toothed, broadly ovate to nearly orbicular in outline, pointed, firm in texture, the base rounded or somewhat heart-shaped, the lower surface becoming smooth or remaining more or less velvety; the roundish leaf-stalks are shorter than the blades. The flowers appear before the



FIG. 122. — Abele.

leaves in March, April, or May. The staminate catkins are about 5 cm. long, the pistillate longer, at least in fruit.

The Abele tree is of rapid growth. The wood is light, soft, and weak, difficult to split and to ignite, and is used in Europe for rollers, packing-cases, and flooring; in ancient times it was used for shields, for which it was well adapted, yielding under a blow without splitting.

2. SWAMP POPLAR — *Populus heterophylla* Linnæus

The Swamp poplar, or Downy poplar, inhabits wet, rich soil, and occurs from Connecticut to New Jersey, south to Georgia, westward to Missouri, Arkansas, and Louisiana. In the southwestern parts of its range it is sometimes about 30 meters high and has a trunk a meter in diameter.

The thick bark is brown and fissured, or broken into loose, long, and narrow plates. The stout young twigs are velvety, becoming gray to reddish brown, and somewhat shining. The slightly resinous leaf-buds are ovoid, pointed, and about 6 mm. long. The long-stalked leaves are 12 to 15 cm. long, or those of young shoots much larger; they are broadly ovate, firm in texture, very velvety when young, blunt or bluntish, finely toothed, rounded to heart-shaped at the base, when mature dark green, dull and smooth, or a little cottony on the upper side, smooth or nearly so beneath; those of young shoots are sometimes persistently velvety; the narrow stipules are 3 cm. long or less. The tree flowers, according to latitude, in March, April, or May, before the leaves unfold. The staminate catkins are stout, stalked, densely many-flowered, 2.5 cm. thick or less, and 7 to 10 cm. long, their scales cut into numerous filiform lobes, the stamens 20 or fewer. The smooth pistillate catkins are several-flowered racemes, 5 cm. long or more, elongating in fruit to several times that length, the flower-stalks also elongating, often becoming 1.5 cm. long; the stigma-lobes are short and much dilated. The capsule is ovoid, pointed, 8 to 12 mm. long.



FIG. 123. — Swamp Poplar.

The tree is also known as Black poplar, Black cottonwood, and Swamp cottonwood. Its wood is soft and brown, with a specific gravity of about 0.41, and is locally used for construction, though not of much value.

3. BALSAM COTTONWOOD — *Populus trichocarpa* Torrey and Gray

The tallest of all poplars, this tree occurs mainly along streams from southern Alaska to southern California, perhaps extending eastward to Montana, attaining

a maximum height of between 60 and 70 meters, with a trunk 2.5 meters in diameter or more.

The thick bark is light gray and deeply fissured on old trunks. The stout young twigs are round or somewhat angled, and finely hairy, becoming orange to gray, and shining. The resinous buds are orange-brown, ovoid, pointed, about 2 cm. long, often curved. The leaves are broadly ovate to ovate-oblong, pointed, rather thick, 8 to 12 cm. long, rounded, slightly heart-shaped or somewhat narrowed at the base and finely toothed with blunt teeth; when young they are more or less hairy, especially on the upper side, when mature dark green, smooth and shining above, light green or almost white and smooth except on the veins of the under side, which are usually a little hairy; the round leaf-stalks vary from 2 to 6 cm. long; the stipules are narrow and 1 to 2 cm. long. The tree flowers, according to latitude, from February to April; the catkins are stalked, their scales cut into many filiform lobes, the staminate ones 8 cm. long or less; there are 40 stamens or more in each staminate flower; the pistillate catkins are usually rather densely flowered, the flowers sessile or nearly so, with nearly sessile, much dilated stigmas and an ovoid hairy ovary. The ripe capsules are nearly globular, about 8 mm. thick, and usually very hairy, whence the specific name *trichocarpa*, but they sometimes become nearly smooth; they are stalkless or very short-stalked.

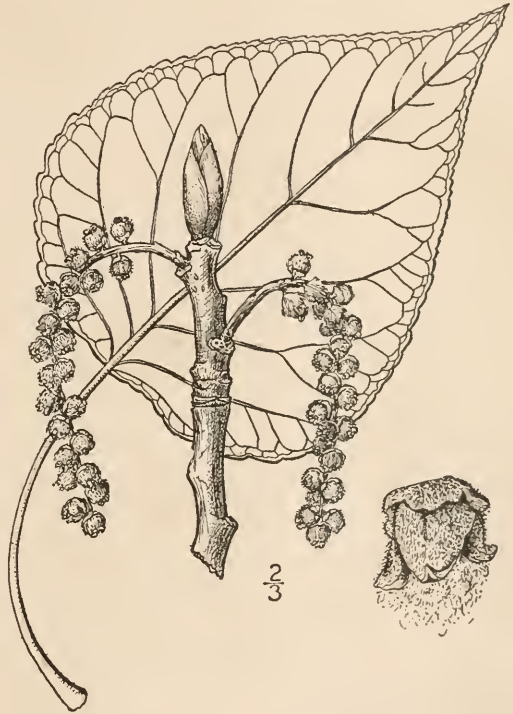


FIG. 124. — Balsam Cottonwood.

The tree grows rapidly and its wood is used for barrels, tubs, bowls, and other wooden-ware; it is brown, soft, and weak, with a specific gravity of about 0.38.

4. BALM OF GILEAD — *Populus canadensis* Aiton

The Balm of Gilead poplar is found from Newfoundland to New Jersey and Virginia, westward to Michigan, South Dakota, Alberta, and Alaska; in the east it occurs mainly as an escape from cultivation, having been extensively planted for shade and ornament, and the source of these planted trees is not definitely known. Evidence that it is wild in Michigan has been adduced, and it is probably indigenous farther to the northwest. It sometimes reaches a height of 30 meters,

with a trunk 2 meters thick. The tree has often been regarded as a variety of the Balsam poplar, *P. balsamifera* Linnæus.

The old bark is thick, gray, and ridged. The young twigs are stout, round, slightly hairy, becoming smooth and shining. The buds are sticky, resinous, narrow, pointed, 2.5 cm. long or less. The leaves are broadly ovate, pointed,



FIG. 125. — Balm of Gilead.

heart-shaped, or truncate at the base, 6 to 15 cm. long, 3 to 12 cm. wide, dark green above, pale green beneath, bluntly and rather evenly toothed, quite hairy when young, the upper surface smooth at maturity, the under side usually more or less hairy on the veins; the leaf-stalks are round and hairy or hairy-fringed. The tree flowers in April or May; the catkins are 12 cm. long, or less, their scales cut into many narrow sharp lobes, the staminate ones densely flowered. The ripe pistillate catkins are often

15 cm. long; the capsules are short-stalked, narrowly ovoid, pointed, smooth, 6 to 8 mm. long.

It is a fast-growing tree, the lower branches widely spreading, and it is desirable for planting where rapid effect is wanted. Its wood closely resembles that of the Balsam poplar, but is slightly heavier, its specific gravity being about 0.39. The western form has been described by Dode as a distinct species, *P. hastata*.

5. RYDBERG'S COTTONWOOD — *Populus acuminata* Rydberg

Populus coloradensis Dode

This species has been confused with the Narrow-leaved cottonwood, which it somewhat resembles. It inhabits the borders of streams and lakes from South Dakota to Assiniboia, western Nebraska, New Mexico, Utah, and Nevada, attaining a maximum height of about 20 meters and a trunk diameter of about 4.5 meters. The lower branches spread widely, the upper are nearly erect.

The old bark is thick, brown, and strongly ridged, that of young stems pale gray or nearly white, and smooth or nearly so. The young twigs are slender, smooth, brown, and round or somewhat angled. The buds are brown and very resinous, pointed, about 1 cm. long. The leaves are rhombic-lanceolate, 5 to 15 cm. long, rather abruptly long-pointed, nearly equally bluntly toothed, except near the base and apex, smooth on both sides, bright green and somewhat shining on the upper side, paler green on the lower, the base usually wedge-shaped, but sometimes rounded; they are drooping or spreading, with round, slender stalks fully one half as long as the blades; the small stipules are ovate. The catkins appear in April or May, and when in flower are about 3 cm. long, their scales sharply cut into numerous filiform lobes; there are 15 or 20 stamens in each staminate flower; the pistillate flowers are stalked, the smooth ovary surmounted by the irregularly lobed stigmas. The pistillate catkins become 10 to 15 cm. long in fruit, with ovoid, bluntish capsules 6 to 8 mm. long, borne on slender stalks 3 to 5 mm. long.

The wood closely resembles that of the Narrow-leaved cottonwood, *P. angustifolia* James. The tree has been much planted for shade and ornament in and about cities and towns within its range.



FIG. 126. — Rydberg's Cottonwood.

6. BALSAM POPLAR — *Populus balsamifera* Linnæus

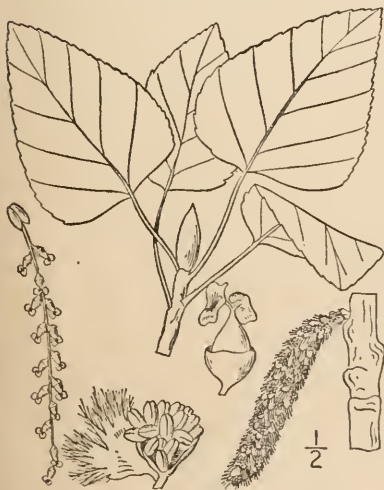


FIG. 127. — Balsam Poplar.

The Balsam poplar, or Tacamahac, inhabits either moist or dry soil, but prefers river and lake shores and the edges of swamps, sometimes reaching a height of 30 meters or more, with a trunk 2 to 2.3 meters in diameter. It is distributed from Newfoundland to Hudson Bay and Alaska, south to Maine, Vermont, western New York, Michigan, South Dakota, Wyoming, and Oregon.

The bark of old trunks is up to 2.5 cm. thick, reddish gray and ridged, that of young stems thinner and light brown or gray. The young twigs are round, stout, somewhat hairy, becoming smooth, reddish brown and shining, finally gray. The very resinous buds are 2.5

cm. long or less, sharp-pointed and shining. The young leaves are sparingly and finely hairy, becoming smooth, firm in texture, dark green and shining on the upper side, pale green or brownish and finely netted-veined on the under surface; they vary from ovate to ovate-lanceolate, and from 7 to 12 cm. long; the margins are finely toothed, the apex pointed, often long-pointed, the base rounded, narrowed or somewhat wedge-shaped, or some leaves occasionally subcordate; the round leaf-stalks are 2 to 9 cm. long, the stipules small, white, and thin. The flowers appear in April or May. The catkins are 10 cm. long or less, their scales cut into a fringe of filiform lobes; the stamens are 30 or fewer, the staminate catkins densely flowered; the pistillate catkins are loosely flowered, the stigma-lobes much dilated and the ovary smooth. The ripe capsules are ovoid, pointed, very short-stalked, about 8 mm. long.

The wood, which is light brown, soft, and weak, with a specific gravity of about 0.36, is used for pails, boxes, and paper-pulp. The tree is not much planted south of its natural range, as it does not well endure hot summers.

7. NARROW-LEAVED COTTONWOOD — *Populus angustifolia* James

This poplar occurs along streams from South Dakota to Assiniboia and the Yukon Territory, south to Nebraska, New Mexico, Chihuahua, Utah, and Nevada, sometimes attaining a height of 20 meters, with a trunk 4 to 5 dm. thick. Its branches are nearly upright.

The bark is thick, light green, that at the bases of old trunks somewhat darker in color, rough or fissured. The round young twigs are yellowish green and smooth, becoming orange to gray. The sticky resinous buds are ovoid, pointed, brown, the terminal ones 1.5 cm. long or less. The leaves vary from lanceolate to ovate; they are pointed or bluntish, very finely and bluntly toothed, firm in texture, narrowed, wedge-shaped or rounded at the base, bright green on the upper side, paler green beneath, 5 to 12 cm. long, smooth or very nearly so on both sides when mature; they are slightly hairy on the under side when unfolding; the round leaf-stalks are one third the length of the blades or less; the stipules are thin and white, about 2 cm. long. The tree flowers



FIG. 128. — Narrow-leaved Cottonwood.

in April or May; the catkins are 2 to 6 cm. long, densely flowered, their scales deeply cut into filiform lobes; the stigma-lobes are widely dilated, the ovoid smooth ovary somewhat 2-lobed. The ripe pistillate catkins are 7 to 10 cm. long, the ovoid blunt-pointed capsules very short-stalked and about 5 mm. long.

The tree is much planted along roads and streets in the West, and grows rapidly. Its wood is light brown, weak and soft, with a specific gravity of about 0.39, and is of little value. The species has often been regarded as a variety of the Balsam poplar and is said to hybridize with it where the two grow together.

8. TWEEDY'S COTTONWOOD — *Populus Tweedyi* Britton, new species

Tweedy's cottonwood is known only from river-bottoms in southern Wyoming.

The young twigs are brownish, somewhat angled, smooth, becoming orange, and finally nearly white. The mature leaves are smooth, thin, firm in texture, broadly ovate or some of them nearly orbicular, very finely toothed, pointed or blunt, rather dark green on the upper side, paler green on the lower, distinctly heart-shaped at the base, or some of them rounded, 3 to 7 cm. long, 2.5 to 4 cm. wide; the stout leaf-stalks are about one fourth as long as the blades. The fruiting pistillate catkins are rather dense, 6 cm. long or less; the capsules are ovoid, finely and densely papillose, 4 mm. long, their stalks only 1 mm. long.

The type specimen was collected by Mr. Frank Tweedy of the United States Geological Survey, at Encampment, Carbon county, Wyoming, June 20, 1901 (no. 4567).



FIG. 129. — Tweedy's Cottonwood.

9. WISLIZENUS' COTTONWOOD — *Populus Wislizeni* (S. Watson) Sargent

Populus Fremontii Wislizeni S. Watson

This poplar inhabits the banks of rivers and streams from southern Colorado to western Texas, New Mexico, and adjacent Mexico, perhaps extending into southeastern Utah. It becomes at least 15 meters high, the lower branches spreading.

The young shoots are brownish, smooth, becoming orange and finally gray. The buds are ovoid, pointed, brown, shining, and about 1.5 cm. long, their scales a little hairy. The leaves are broadly triangular, often longer than wide, firm in texture, coarsely and irregularly bluntly toothed, except near the tip, sharp-pointed, smooth, light green on both sides, 5 to 10 cm. long, nearly truncate or somewhat kidney-shaped at the base, finely netted-veined; their stalks are flattened sideways and about as long as the blades; the stipules are ovate, thin, and pointed. The



FIG. 130. — Wislizenus' Cottonwood.

catkins appear in March or April and when in flower are 10 cm. long or less, their scales fringed with filiform lobes; the pistillate flowers are slender-stalked with an ovoid blunt ovary, the stalks becoming 1 cm. long in fruit or more, and nearly as long as the ovoid-pyramidal pointed papillose capsule. The wood is very similar to that of Fremont's cottonwood, but somewhat lighter in weight, its specific gravity being about 0.46.

10. FREMONT'S COTTONWOOD — *Populus Fremontii* S. Watson

Fremont's cottonwood inhabits valleys in California from the upper Sacramento to the southern part of the State, Lower California, and into western Nevada. It is often a very large tree, occasionally 35 meters high, with a trunk up to 2 meters thick; its branches spread widely and droop at the ends.

The bark of young trees is light gray and smooth, that of old trunks much thicker, dark brown, and ridged. The young twigs are gray-brown, sometimes finely hairy, becoming orange and smooth. The buds are ovoid, pointed, the terminal ones about 1 cm. long. The leaves are broadly triangular, abruptly short-pointed, commonly wider than long, coarsely and bluntly toothed, except near the tip, rather thin, 5 to 8 cm. long, the base truncate, or somewhat heart-shaped or kidney-shaped; when unfolding they are finely hairy, but at maturity are usually smooth, bright green and somewhat shining on the upper surface; the leaf-stalks are about as long as the blades, slender, and flattened laterally. The tree flowers in February or



FIG. 131. — Fremont's Cottonwood.

March, the catkins then being about 5 cm. long, the staminate ones densely flowered; the scales are fringed with filiform lobes; the stalks of the pistillate flowers are very short, the disks dilated and rather large, the ovary smooth. In ripening the pistillate catkins elongate to 10 cm. or more, the ovoid bluntish capsules become 8 to 12 mm. long and much longer than their stalks.

The wood is soft, light brown, and weak, with a specific gravity of about 0.48.

II. MEXICAN COTTONWOOD — *Populus mexicana* Wesmæl

The Mexican cottonwood has been confused with Fremont's cottonwood, to which it is very closely related. It inhabits the banks of streams and rivers in northern Mexico, extending northward into New Mexico and Arizona; it is not known to occur in California. The tree is round-topped, with spreading branches, and reaches a maximum height of 25 meters or more, with a trunk sometimes 1.5 meters in diameter.

The bark is light gray, that of old trunks thick and ridged, at least near the base, that of young trees much thinner and smooth. The young twigs are greenish gray, hairy, soon becoming smooth and pale orange to orange-brown. The buds are orange-brown, finely hairy, 6 to 10 mm. long, pointed. The leaves are broadly rhombic-ovate to nearly triangular-ovate, the base broadly wedge-shaped or truncate, the apex usually long-pointed; they are coarsely and bluntly toothed, firm in



FIG. 132. — Mexican Cottonwood.

texture, quite hairy when unfolding but smooth when mature, the upper side light green and shining; the leaf-stalks are only a little flattened sideways, and as long as the blades, or shorter. The ovate hairy stipules are pointed and about 7 mm. long. The tree flowers in February or March, with catkins about 6 cm. long; the staminate catkins are densely flowered and over 1 cm. thick; the pistillate flowers are short-stalked, the blunt ovary subtended by a cup-shaped disk 6 to 8 mm. wide. The ripe pistillate catkins are 10 cm. long or more, the stalks of the flowers elongating to 4 or 5 mm., the capsule ovoid, blunt, about 8 mm. long.

The tree has been much planted in cities and towns within its range.

12. BLACK POPLAR — *Populus nigra* Linnæus

This European poplar has been found in the valleys of the Hudson and Delaware rivers, doubtless spread from trees planted many years ago. The tree of the Hudson valley was supposed by F. A. Michaux to be distinct from the European black poplar, and was described by him under the name *P. hudsonica*. Little is known of it in either valley at the present time. The Black poplar is widely distributed in Europe, becoming 30 meters high, with a trunk over one meter thick; the branches spread widely and the tree is round-topped.

Its bark is ashy gray, or that of old trunks darker, thick, rough, and furrowed.



FIG. 133. — Black Poplar.

The young, round shoots and the leaves are at first somewhat hairy, but become smooth or nearly so, the twigs turning orange to gray. The buds are ovoid, pointed, glutinous, and about 8 mm. long. The leaves are broadly triangular-ovate, firm in texture, sharp-pointed, bluntly toothed, except near the base and apex, 5 to 10 cm. long, the base broadly wedge-shaped or truncate; they are rather light green on both sides, the upper surface shining; the leaf-stalks are flattened sideways and are as long as the blades or shorter. The catkins appear in March or April, are hairy, and about 5 cm. long when in flower, their scales long-fringed; the staminate ones are red. By the time that the oblong, very blunt capsules have ripened, the

pistillate catkins have elongated to 10 or 12 cm., the stalks of the capsules remaining very short. The disk of the pistillate flowers is very small.

The wood is yellowish, soft, and weak, with a specific gravity of about 0.45; it is used in Europe for boxes and woodenware. The tree grows rapidly and requires plenty of room for its full development.

13. LOMBARDY POPLAR — *Populus italica* Moench

Populus dilatata Aiton

While scarcely to be regarded as an element in the wild arborescent flora of North America, the Lombardy poplar has been so much planted for ornament and as a curiosity that it is as familiar in many places as any native species, and it occasionally spreads by sending up shoots from its roots. It is widely distributed in Europe, but it is not definitely known to be native there, even in northern Italy, and may have been introduced from Asia at a very remote period. The tree is often regarded as a variety of the Black poplar, and it has been supposed

to have originated in some way from that species. Specimens 50 meters high have been known in France. The branches are all characteristically upright.

The bark of old trees is gray to brown and deeply furrowed. The young twigs are olive-green, becoming gray, the buds pointed and 6 to 8 mm. long. The leaves are triangular-ovate to rhombic, toothed nearly all around, smooth on both sides, and 4 to 10 cm. long when mature, rather thin, bright green above, paler beneath, pointed or long-pointed, the base broadly wedge-shaped to truncate; the slender leaf-stalks are as long as the blades or somewhat shorter, and flattened sideways. The catkins resemble those of the Black poplar, but the staminate ones are more slender. The capsules are very short-stalked.



FIG. 134. — Lombardy Poplar.

The tree is of rapid growth but of short duration, individuals over fifty years old being usually very ragged. Its wood is described as similar to that of the Black poplar but of inferior quality.

14. CAROLINA POPLAR — *Populus deltoides* Marshall



FIG. 135. — Carolina Poplar.

This Cottonwood of eastern North America, also called Necklace poplar, on account of its long necklace-like ripe fruiting catkins, inhabits moist soil, especially the banks of streams and lakes, from Quebec westward to Manitoba, south to Florida and Tennessee; it is not, however, common near the Atlantic coast. The tree attains a maximum height of about 45 meters, with a trunk diameter of 2 meters or more; its limbs are large, thick, and spreading, the diameter of old individuals being often as great as their height.

The bark is gray or gray-green, that of young trees thin and smooth, that of old ones thick and fissured, with rounded ridges. The young twigs are rather stout, smooth, yellowish green and shining, becoming gray. The pointed ovoid buds are somewhat resinous, the terminal ones about 1 cm. long.

The leaves are broadly triangular-ovate, rather finely and bluntly toothed, pointed, sometimes long-pointed, 10 to 17 cm. long, firm in texture, the base truncate, slightly heart-shaped or rarely broadly wedge-shaped; when very young they are somewhat hairy, but soon become smooth on both sides, bright green and shining above, paler beneath; the leaf-stalks are laterally flattened and about as long as the blades; the narrow stipules are 1 to 2.5 cm. long. The catkins are short-stalked, and at flowering time in April or May are 7 to 12 cm. long, their scales fringed by numerous filiform lobes, the staminate ones densely flowered and 10 to 12 mm. thick; the pistillate flowers are short-stalked, the disk small and appressed to the ovary, which is surmounted by 3 or 4 large lobed stigmas. In ripening the pistillate catkins elongate greatly, becoming 15 to 25 cm. long; the capsules are ovoid, pointed, 8 to 10 mm. long, and about as long as their stalks.

The tree grows with great rapidity, young plants often increasing in height as much as 4 meters during a season. The wood is soft, weak, and brown, with a specific gravity of about 0.39; it is used for boxes and for paper-pulp. M. Dode, a French dendrologist, has expressed the view that the Carolina poplar can be divided into several species.

15. WESTERN COTTONWOOD — *Populus Sargentii* Dode

Populus deltoides occidentalis Rydberg

This species is very closely related to *Populus deltoides* Marshall, of which it has been regarded as a variety. It is a very large tree, with spreading branches, and inhabits river bottoms from Saskatchewan and Alberta to South Dakota, Nebraska, Kansas, Colorado, and New Mexico.



FIG. 136. — Western Cottonwood.

The bark is gray, that of old trees thick. The young twigs are smooth, greenish, becoming light yellow and shining. The buds are glutinous, pointed, the terminal ones 1 cm. long or more. The leaves are smooth on both sides when mature, broadly triangular, commonly wider than long, rather long-pointed, coarsely and bluntly toothed,

except at the apex and base, 10 cm. long or less, the base usually more or less kidney-shaped, varying to truncate; there are sometimes 2 very small glands at the base of the blade on the upper surface; the leaf-stalks are much flattened side-

ways and about as long as the blades. At flowering time in March or April the catkins are 5 to 8 cm. long, and not very dense; the pistillate flowers are short-stalked, the disk small, the usually 3 stigmas much dilated. In ripening, the pistillate catkins become 12 cm. long or more, the papillose capsules 1 to 1.5 cm. long, and longer than their stalks.

The tree is much planted for shade and ornament; its wood much resembles that of its eastern relative, but is lighter, its specific gravity being about 0.34.

16. LARGE-TOOTHED ASPEN — *Populus grandidentata* Michaux

A forest tree, attaining a maximum height of about 25 meters, with a trunk sometimes 6 to 7 meters thick. It prefers rich soil, and ranges from Nova Scotia to Delaware, in and along the mountains south to North Carolina, westward to Ontario, Minnesota, Illinois, and Tennessee.

The bark is thin, smooth, and light greenish brown, except at and near the bases of old trunks where it is much thicker, fissured and dark brown. The stout young twigs are quite velvety, becoming smooth, reddish brown, and shining. The buds are finely hairy, 5 or 6 mm. long, and pointed. The leaves are ovate, 6 to 12 cm. long, or those of young trees very much larger (sometimes 3 dm. long); when young they are densely white-velvety on the under side, becoming smooth or nearly so when old, or those of young shoots persistently velvety beneath; they are pointed at the apex, and rounded or narrowed at the base, rarely somewhat heart-shaped, coarsely and irregularly toothed, or those of young shoots finely toothed; the upper surface is dark green and dull; the leaf-stalks are laterally flattened, 2.5 to 7 cm. long, the stipules linear, 2 cm. long or less. The catkins appear in March or April, and are 10 cm. long or less at flowering time, the pistillate ones much elongated in fruit; the scales are long-hairy, irregularly lobed above the middle; the staminate flowers have 6 to 12 stamens; the stigma-lobes of the pistillate flowers are linear. The ripe capsule is conic, about 6 mm. long and papillose.

The foliage turns bright yellow in autumn. The wood is weak and soft, is largely used for paper-pulp, and to a small extent for woodenware; it is light brown with a specific gravity of about 0.46.



FIG. 137. — Large-toothed Aspen.

17. AMERICAN ASPEN — *Populus tremuloides* Michaux

The American aspen is widely distributed, ranging from Newfoundland across British America to Alaska, south to southern New York, Pennsylvania, Kentucky,

Missouri, Nebraska, in the Rocky Mountains to New Mexico, and Chihuahua, and in the Sierra Nevada to middle California; it is reported to extend into Lower California. The tree prefers sandy, gravelly, or rocky soil, and attains a maximum height of about 35 meters, with a trunk up to 1 meter in diameter.



FIG. 138. — American Aspen.

Its branching is usually irregular, and the branches sometimes droop at the ends; forms are occasionally seen in which the branches are decidedly pendulous. The bark, except near the bases of old trees, where it is thick, fissured, and nearly black, is rather thin, nearly smooth and pale yellowish green or yellowish brown. The young twigs are greenish and loosely hairy, soon becoming smooth, reddish brown and shining. The buds are ovoid, pointed, a little sticky, about 7 mm. long, their scales shining. When

young the leaves are hairy-fringed, but quite smooth when mature, thin, dark green and somewhat shining on the upper side, pale green on the lower; they are ovate to nearly orbicular, finely and quite regularly toothed, with low, blunt teeth, rather abruptly short-pointed, rounded or somewhat heart-shaped at the base, 2 to 6 cm. long and about as wide as long, or those of young plants much larger; they quiver on their slender flat yellowish stalks in the lightest breeze; the stipules are narrow and nearly white. The catkins are 6 cm. long or less at flowering time, or the pistillate ones longer; their scales are deeply 3-lobed or 5-lobed and fringed with long hairs; there are 6 to 12 stamens in the staminate flowers; the stigma-lobes of the pistillate flowers are linear. The conic capsules are pointed and 5 to 6 mm. long.

The American aspen is one of the first trees to reforest denuded slopes in the north, its numerous seeds being widely spread by the wind and it grows rapidly. The leaves turn yellow in the autumn and contribute much to the coloration of the woods. Its wood is soft, weak, and soon decays; it is used in great quantities for paper-pulp, is light brown in color, with a specific gravity of about 0.40. The name *tremuloides* is with reference to the similarity of this tree to the European aspen, *Populus tremula* Linnæus.

18. CERCIS-LEAVED ASPEN — *Populus cercidiphylla* Britton, new species

This name is proposed for a tree, observed by Dr. C. C. Curtis in the Upper Hoback basin, Wyoming, in August, 1900, which has foliage so different from the American aspen that we think it must represent a distinct species.

The twigs are smooth, the young shoots brown, becoming gray; the resinous

shining winter buds are oblong, blunt, about 3 mm. long. The reniform-orbicular leaves are 3.5 cm. wide or less, rather firm in texture, smooth, rounded, or some of them very blunt-pointed, slightly heart-shaped at the base, their margins entire, or inconspicuously undulate, the upper surface dull green, the under side pale; the lowest pair of veins are nearly as strong as the midvein; the slightly flattened, rather stout yellowish leaf-stalks are 1.5 to 2 cm. long, and a little shorter than the blades, or about as long. At the base of the leaf-blade, on the under side, are two brownish, oblong concave glands, about 1.5 mm. long.



FIG. 139. — Cercis-leaved Aspen

II. THE WILLOWS

GENUS **SALIX** [TOURNEFORT] LINNÆUS



WILLOWS comprise about 200 species of trees or shrubs principally of the north temperate and arctic zones, very few occurring in the southern hemisphere. Numerous fossil species have also been described. Aside from their value as shade trees and ornamentals and the protection of the banks of streams, they are not so important economically now, as in former times, when their flexible twigs and bark were more largely used as a coarse fiber and their herbage as fodder. They are still very important in basketry; the bark is used in tanning and very sparingly in medicine; the wood is used to some extent in Europe but very little in this country, except for fuel and for charcoal, which is preferred for medicinal use and is also used as black crayon by artists.

They have soft, brittle, usually light-colored wood, single-scaled buds, which are mostly lateral. The leaves are usually narrow and short-stalked, persistent in a few species, their stipules often very large and broad. The flowers are dioecious, in cylindric catkins with entire bracts, the staminate usually dense, erect, spreading or drooping, the flowers with 1 to 10, usually 2 stamens, their filaments usually distinct. The pistillate catkins are erect or spreading; the ovary sessile or very short-stalked; style short or thread-like; stigmas 2, entire or 2-parted. The fruit is a dry capsule, usually 2-valved; seeds very small and numerous, narrowed at each end and surrounded by a dense tuft of hairs.

The name is the ancient name of the willow, the type species being the White willow of Europe, *Salix alba* Linnæus.

In addition to the arborescent species there are about 100 kinds of shrubs known from our area. Willows hybridize very freely, and many natural crosses between species have been noted.

A. Capsule glabrous, at least when mature (except in *S. sessilifolia*).

a. Stamens 3 to 11 (sometimes only 2 in *S. fragilis*).

Pedicels of capsules slender, three to five times as long as the gland (short in *S. Toumeyi*); native trees.

Stipules and petioles without glands.

Leaves green beneath.

Bark of the twigs green to brown.

Ovary glabrous; stamens 3 to 7; bracts of catkins ovate to oblong; eastern tree.

1. *S. nigra*.

Ovary and young capsule more or less pubescent; stamens 5 to 11; bracts of catkins mostly obovate; California tree.

2. *S. vallicola*.

Bark of the twigs yellow to yellow-green; southwestern tree.

3. *S. Wrightii*.

Leaves glaucous or pale beneath.

Pedicels filiform, often nearly as long as the capsules or longer.

Bracts of catkins entire-margined; eastern tree.

4. *S. longipes*.

Bracts of catkins dentate; California tree.

5. *S. laevigata*.

Pedicels distinctly shorter than the capsule, often very short.

Leaves narrowly lanceolate; capsules almost sessile.

6. *S. Toumeyi*.

Leaves broadly lanceolate; capsules distinctly stalked.

7. *S. amygdaloides*.

Stipules and usually also the petioles with glands.

Leaves ovate-lanceolate; glands of stipules and petioles usually stalked; eastern tree or shrub.

8. *S. lucida*.

Leaves lanceolate; glands sessile; western trees or shrubs.

9. *S. lasiandra*.

Leaves green on both sides.

10. *S. Lyallii*.

Leaves white-glaucous beneath.

Pedicels of capsules short, only about twice as long as the gland; introduced European tree.

11. *S. fragilis*.

b. Stamens 2 only.

Filaments hairy toward the base; bracts of the catkins deciduous.

Pedicels of the capsules less than 1 mm. long; large trees introduced from Europe.

Branches not drooping; leaves lanceolate.

12. *S. alba*.

Branches drooping; leaves linear-lanceolate.

13. *S. babylonica*

Pedicels of the capsules 1 to 3 mm. long; native trees or shrubs.

Capsule glabrous when mature.

Leaves sharply serrulate, glabrous or slightly hairy when mature; eastern tree or shrub.

14. *S. interior*.

Leaves entire, or minutely and distantly serrulate, silky-canescens; western tree or shrub.

15. *S. exigua*.

Capsule densely white-silky, even when mature.

16. *S. sessilifolia*.

Filaments glabrous; bracts of pistillate catkins persistent.

- Leaves lanceolate, oblong-lanceolate or oblanceolate, three times or more as long as wide.
- Leaves slightly serrate, green on both sides; northwestern tree. 17. *S. Mackenziana*.
- Leaves whitish or canescent beneath.
- Leaves acute; filaments distinct; tree of the Central States. 18. *S. missouriensis*.
- Leaves acuminate; filaments united below; tree of California and Arizona. 19. *S. lasiolepis*.
- Leaves obovate to elliptic-obovate or ovate-oval, less than three times as long as wide.
- Twigs glabrous, or merely puberulent when very young; eastern tree or shrub. 20. *S. balsamifera*.
- Twigs villous-pubescent or tomentose; western trees or shrubs.
- Style three to five times longer than the stigmas; Alaskan tree. 21. *S. amplifolia*.
- Style as long or twice as long as the stigmas; northwestern tree. 22. *S. Hookeriana*.
- B. Capsule pubescent, silky or tomentose (nearly glabrous in Texan specimens of *Salix taxifolia*).
- a. Filaments distinct.
- Leaves linear-lanceolate to narrowly lanceolate.
- Leaves dark green above, 7 to 15 cm. long; silvery-white beneath; style long; European introduced tree. 23. *S. viminalis*.
- Leaves not dark green above, only 1 to 4 mm. long; style short or none; southwestern and Mexican tree. 24. *S. taxifolia*.
- Leaves lanceolate to oblong, oblanceolate or obovate.
- Stamen only 1; pedicels of capsules very short; far western tree with leaves satiny beneath. 25. *S. sitchensis*.
- Stamens 2; leaves not satiny, but often pubescent or tomentose beneath.
- Capsule distinctly pedicelled; leaves not white-felty beneath.
- Bracts of the catkins yellow.
- Style none, or very short; northern tree or shrub. 26. *S. Bebbiana*.
- Style slender, distinct; California tree or shrub. 27. *S. Bakeri*.
- Bracts of the catkins black or brown.
- Leaves distinctly toothed; eastern tree or shrub. 28. *S. discolor*.
- Leaves nearly or quite entire; western tree or shrub. 29. *S. Scouleriana*.
- Capsule very short-pedicelled; leaves densely white-felty beneath; Alaskan tree. 30. *S. alaxensis*.
- b. Filaments united; ovary and stigmas sessile; European introduced tree. 31. *S. purpurea*.

1. BLACK WILLOW — *Salix nigra* Marshall

Salix marginata Wimmer

The Black willow is the largest native species of eastern North America, sometimes attaining a height of 40 meters, with a trunk a meter in diameter in the central States, usually much smaller, however, and commonly 10 to 20 meters high, with the trunk not over 5 dm. thick; the trunks are often two to five together

from the same roots, and are seldom strictly erect. The tree grows in wet soil from New Brunswick to western Ontario and North Dakota, south to Florida and Texas.

The branching is very irregular. The bark is rough, thick, nearly black, whence the common name, and flakes off in narrow strips; the slender, smooth, or somewhat hairy young twigs are green to greenish brown, soon becoming darker;



FIG. 140. — Black Willow.

the winter buds are pointed and 2 to 3 mm. in length. The narrowly lanceolate leaves are often somewhat scythe-shaped, finely toothed, long-pointed, 6 to 15 cm. long, 4 to 16 mm. wide, bright green and smooth on the upper side, a little lighter green and often hairy beneath, at least on the veins; their stalks are slender, often hairy, 4 to 8 mm. long, the stipules cordate or reniform, often large, those of leaves of young shoots sometimes 16 mm. broad and persistent until summer, but usually much smaller and fall away early. The catkins are borne on short, leafy branches of the season, appearing from March to May, according to latitude, and are 4 to 8 cm. long; their bracts are ovate or oblong, blunt or acutish,

finely and densely hairy; the staminate flowers have from 3 to 7 stamens with filaments hairy toward the base; the pistillate flowers have an ovoid stalked smooth ovary; the notched stigmas nearly sessile. The pistillate catkins are from 5 to 10 cm. long and about 1 cm. thick in fruit; the capsules are smooth, ovoid-conic, 3 to 4.5 mm. long, borne on slender stalks 1 to 2 mm. long, several times as long as the gland.

The wood is light red-brown, soft and weak, the sapwood much lighter in color than the heart; its specific gravity is about 0.44; it is seldom used except for fuel. The tree grows rapidly in wet soil, and is useful for screen-planting along swamps or streams. The bark is used as a tonic in domestic medicine.

2. DUDLEY'S WILLOW — *Salix vallicola* (Dudley) Britton

Salix nigra vallicola Dudley

This tree inhabits river-banks in southern California and appears to be specifically distinct both from the eastern Black willow and from Wright's willow of the southwestern States, while closely related to both. It reaches a height of from 8 to 12 meters.

Its bark is dark-colored and rough, the young twigs yellowish green and slightly hairy, becoming smooth and purplish or gray. The leaves are narrowly lanceolate, pointed or long-pointed at the apex, narrowed at the base, finely toothed with

glandular-tipped teeth, somewhat hairy on both sides when unfolding, soon becoming smooth and about the same shade of green above and beneath; they are from 5 to 12 cm. long, from 7 to 12 mm. wide, and their hairy stalks are 4 to 6 mm. long; their stipules are 10 mm. long or less, lanceolate, glandular-toothed, and fall away early in the season. The catkins are 2.5 to 5 cm. long, borne at the ends of short, leafy branches of the season, and flower as the leaves unfold in March or April; their axes are very hairy, and their almost woolly scales are obovate or rounded; the staminate flowers have from 5 to 11 stamens with separate filaments hairy toward the base; the pistillate flowers have a stalked ovary with a very short style and lobed stigmas. The capsule is ovoid, smooth, 4 or 5 mm. long, 1.5 to 2 times as long as its stalk.



FIG. 141. — Dudley's Willow.

This is the largest species of willow native in southern California.

3. WRIGHT'S WILLOW — *Salix Wrightii* Andersson



FIG. 142. — Wright's Willow.

Wright's willow occurs abundantly in wet soil, especially along rivers and streams, from Texas to southern Arizona and through adjacent Mexico. The tree closely resembles the Black willow in botanical characters, and has been regarded by many authors as a variety of that species, and it has also been mistaken, at least in part, for the Cuban *Salix occidentalis* Koch.

The bark is rough and flaky; the young twigs are smooth or slightly hairy, and yellow to yellow-green, becoming brown, and this yellow tint of the branchlets seems

to be the most reliable feature to distinguish the tree from the Black willow. The leaves are narrowly lanceolate, finely toothed, bright green above, rather paler on the under side than those of *Salix nigra* Marshall, 5 to 12 cm. long, their slender stalks 5 to 10 mm. long, their stipules small and early deciduous. The catkins appear in early spring on short, leafy twigs of the season, are 5 to 7 cm. long, and densely many-flowered, their bracts blunt and very hairy; the staminate flowers have from 3 to 5 stamens with filaments hairy toward the base; the pistillate flowers have a smooth, conic-ovoid ovary with nearly sessile notched stigmas. In fruit the pistillate catkins become 8 cm. long or less, the capsule about 5 mm. long, its slender stalk less than half as long and several times longer than the gland.

4. WARD'S WILLOW — *Salix longipes* Andersson

Salix Wardi Bebb

Ward's willow is a small tree, or often a mere shrub, occurring on gravelly river-shores and river bottoms, from Maryland to Kentucky and Missouri, south to Florida, Texas, New Mexico, and apparently into Chihuahua; it attains a maximum height of about 10 meters, with a trunk 2 dm. in diameter, and was formerly regarded as a variety of *Salix nigra* Marshall.

Its bark is thick, brown, rough, broken into angular plates; the young twigs



FIG. 143. — Ward's Willow.

are more or less densely hairy, or quite smooth, reddish brown, becoming gray to brown; the winter buds are brown, pointed, shining, about 2 mm. long. The leaves are lanceolate to oblong-lanceolate, some of them occasionally oblanceolate, 6 to 17 cm. long, 1 to 3 cm. wide, finely or rather distantly toothed, varying to almost entire-margined; they are bright green and smooth on the upper side, pale and glaucous and often quite hairy on the under side; their slender, hairy, or smooth stalks are 8 to 15 mm. long, their stipules early deciduous, or sometimes remaining until summer. The catkins are on short, leafy branchlets of the season, flowering at the northern range of the species in April or early May, in Florida

in December or January; they are 5 to 10 cm. long, with blunt, entire-margined, hairy bracts; there are from 3 to 7 stamens in the staminate flowers, their filaments hairy toward the base; the pistillate flowers have a smooth, long-stalked ovoid ovary with nearly sessile notched stigmas. The capsules are ovoid-conic, 5 to 6 mm. long, smooth, their slender stalks often as long as the capsule.

The wood of Ward's willow is rather dark brown, weak and soft, the sap-wood nearly white.

5. CALIFORNIA BLACK WILLOW — *Salix lævigata* Bebb

Salix congesta (Bebb) Howell. *Salix lævigata congesta* Bebb

This tree grows along streams and lakes from southern Oregon throughout California, extending eastward into Nevada and Utah. It sometimes becomes 15 or 16 meters high, with a trunk up to 6 dm. thick, but is commonly considerably smaller.

The dark brown bark is thick and irregularly fissured; the young twigs are orange-brown and vary from smooth to densely velvety-hairy; the winter buds are ovoid, about 3 mm. long. The leaves vary greatly in form from narrowly lanceolate to oblong, oblanceolate or even obovate, and from finely and closely toothed to entire-margined, from long-pointed to obtuse, and from 6 to 20 cm. long, the largest being found on strong, sterile shoots, as in other willows; they are dark green, smooth, and shining on the upper side, pale or sometimes nearly white, and either smooth or hairy, on the under surface; their stalks are short, rarely more than 6 or 8 mm. long, and their ovate stipules are usually small, and fall away soon after they appear. The catkins, which are borne on short, leafy branchlets of the season, flower from March to May, according to latitude, are from 5 to 10 cm. long, their axes and the toothed bracts very hairy; the staminate flowers usually have 5 stamens with filaments hairy toward the base, and the pistillate flowers have a smooth, ovoid-conic stalked ovary, the notched stigmas about as long as the short style. In fruit the pistillate catkins sometimes elongate considerably, but they are often short, sometimes not more than 4 cm. long; the smooth, ovoid-conic capsules are 4 to 6 mm. long, their slender stalks as long, or much shorter.

The wood is soft, weak, brittle, light reddish brown, the sapwood nearly white; its specific gravity is about 0.49.



FIG. 144. — California Black Willow.

6. TOUMEY'S WILLOW — *Salix Toumeyi* Britton, new species

Salix Humboldtiana Sargent, not Humboldt, Bonpland and Kunth

Toumey's willow inhabits the shores of streams in cañons of the mountains of southern Arizona, and has been confused with Humboldt's willow, a native of

southern Mexico. It is a small, slender, beautiful tree, 10 to 12 meters high, with a trunk up to 4 dm. thick, the slender branches somewhat drooping.

Its bark is brown, thick, and irregularly fissured; the young twigs are smooth, shining, yellow-brown, becoming darker. The leaves are lanceolate to linear-lanceolate, long-pointed, smooth on both sides, even when young, firm in texture and persistent on the branches until late in the autumn or into the winter; they are 12 cm. long or less, 1 to 2 cm. wide, finely toothed, bright green and shining on the upper side, bright white beneath; their stalks are 6 to 12 mm. long; the ovate stipules fall away early, or those on strong shoots persist until summer. The catkins appear in February or March on twigs of the preceding season, subtended at the base by two or more small leaves; they are small, nearly stalkless, only 2 to 3 cm. long, and their obovate blunt bracts are hairy; the staminate flowers have 3 or 4 stamens with filaments a little hairy at the base, the pistillate ones have a short-stalked

smooth ovoid ovary and almost sessile stigmas. The fruiting catkins are compact, 2.5 cm. long or less, nearly 1 cm. thick, the very short-stalked ovoid yellowish capsules 3 to 4 mm. long.



FIG. 145. — Toumey's Willow.

7. PEACH-LEAVED WILLOW — *Salix amygdaloides* Andersson

This species inhabits river-shores and similar situations from Quebec through Ontario to Manitoba and British Columbia, extending south to New York, Ohio, Illinois, Missouri, Texas, New Mexico, and Oregon, being most abundant in the Rocky mountain region.

The tree attains a maximum height of about 20 meters, with a trunk up to 6 dm. in diameter; it is usually much smaller, however; it has been regarded by some authors as a variety of the Black willow. Its bark is thick, brown, and irregularly fissured; the slender smooth young twigs are orange-brown, becoming darker brown; the winter buds are ovoid, pointed, shining, about 3 mm. long. The leaves are rather broadly lan-



FIG. 146. — Peach-leaved Willow.

ceolate, sometimes ovate-lanceolate, 6 to 12 cm. long, 1 to 3 cm. wide, long-pointed, finely toothed, bright green and somewhat shining on the upper side, pale or glaucous beneath, rather thin, deciduous in early autumn; their stalks are slender, 6 to 15 mm. long, their stipules usually small and falling away early, those of leaves of strong shoots sometimes large, reniform, 10 to 15 mm. wide. The catkins appear on short, leafy branches of the season early in the spring, and are from 3 to 8 cm. long; the staminate flowers have 3 to 9 stamens with filaments somewhat hairy toward the base; the pistillate ones have a smooth-stalked, oblong-ovoid ovary, a short style and notched stigmas. The fruiting catkins elongate to 6 to 10 cm.; the ovoid-conic capsules are 5 to 6 mm. long, their slender stalks one half to two thirds as long.

The wood is soft and weak, light brown, the sapwood nearly white; its specific gravity is about 0.45; it is used in the Northwest for clapboards and for charcoal. The tree is also called Almond leaf willow.

8. SHINING WILLOW — *Salix lucida* Muhlenberg

A strikingly lustrous-leaved willow, growing in wet soil, especially in and along swamps, from Newfoundland to New Jersey and Pennsylvania, westward to Athabasca, Kentucky, and Nebraska. It is often a shrub, but sometimes forms a tree 8 meters tall, with a trunk diameter of 2 dm.

The bark is smooth, or nearly so, brown or reddish brown; the young twigs are orange-brown, at first often hairy, soon becoming smooth and shining; the winter buds are smooth, pointed, 4 to 6 mm. long. The lanceolate or ovate-lanceolate leaves are pointed, often very long-pointed, 7 to 15 cm. long, 1.5 to 4 cm. wide, finely toothed, the teeth mostly glandular, the upper surface smooth, dark green, brightly shining, the under side at first usually hairy, but becoming smooth and paler green than the upper; the leaf-stalks are more or less hairy, 6 to 12 mm. long, usually glandular toward the base of the blade with stalked glands; the stipules are glandular-toothed, broad, sometimes 7 mm. wide, and fall away early or remain until summer. The catkins, which vary from 2 to 6 cm. in length, appear in May on short, leafy branchlets of the season, their axes hairy, their bracts blunt, sometimes toothed, usually somewhat hairy; there are usually 5 stamens in the staminate flowers, with filaments slightly hairy toward the base, and the pistillate flowers have a narrowly ovoid ovary with nearly sessile notched stigmas. The fruiting catkins are 6 cm. long or less, the narrowly ovoid capsules smooth, much longer than their stalks.



FIG. 147. — Shining Willow.

The Shining willow grows rapidly in wet places and is very desirable for ornamental planting in such situations.

9. WESTERN BLACK WILLOW — *Salix lasiandra* Ben'ham

Salix pentandra caudata Nuttall. *Salix Fendleriana* Andersson

This is the largest of the West American willows, sometimes attaining a height of 20 meters or more, with a trunk a meter in diameter, though it is usually much smaller, and sometimes shrubby. It grows along streams and lakes from British Columbia to southern California, Montana, Wyoming, Colorado, and New Mexico.



FIG. 148. — Western Black Willow.

The rough and thick fissured bark is dark brown; the young twigs are usually hairy, yellowish or reddish brown, becoming darker brown or purplish; the winter buds are ovoid, pointed, 5 to 6 mm. long. The leaves vary from lanceolate to oblong-lanceolate, or sometimes widest a little above the middle, and from 7 to 15 cm. long by 1 to 2.5 cm. in width; they are pointed at the apex, often long-pointed, sometimes slightly scythe-shaped, mostly narrowed at the base, finely glandular-toothed, dark green and shining on the upper side, paler green beneath, hairy when unfolding but smooth on both sides when fully grown, or rarely remaining some-

what hairy on the under side; their stalks are 12 mm. long or less, smooth or hairy and usually bear one or more sessile glands at the base of the blade; the stipules are glandular-toothed, and usually fall away early. The catkins appear in May or June on short leafy branchlets of the season; they are from 3 to 6 cm. long, their bracts obovate or oblanceolate, hairy toward the base, glandular-toothed, at least toward the apex; there are from 5 to 9 stamens in the staminate flowers; the ovary in the pistillate flowers is narrowly ovoid-conic, with nearly sessile notched stigmas. The fruiting catkins are 4.5 to 6 cm. long, the smooth, ovoid-conic capsule 5 to 6 mm. long, its stalk 1.5 to 2 mm. long.

The wood is soft and weak, light brown, its specific gravity about 0.46; it is used to some extent for veneering and for charcoal; also for baskets and for fuel.

10. LYALL'S WILLOW — *Salix Lyallii* (Sargent) Heller*Salix lasiandra Lyallii* Sargent

Lyall's willow is closely related botanically to *Salix lasiandra* Benthams, just described, but it is maintained, by observers who have studied it in its native regions, to be readily distinguishable from that species. It grows along streams and lakes from the Yukon Territory to British Columbia, Montana, and Oregon, perhaps extending also into California.

The differences relied upon to separate this tree from *Salix lasiandra* Benthams are its larger leaves, sometimes 20 cm. long and 4 cm. wide, mostly rounded or somewhat heart-shaped at the base, and bright white or very pale green on the under side, forming strikingly conspicuous foliage; the leaf-stalks are also rather longer and more glandular, and the fruiting catkins larger, sometimes 7.5 cm. long; the bracts of the catkins are less glandular, sometimes quite entire-margined.

Its wood is very similar to that of the Western black willow.



FIG. 149. — Lyall's Willow.

11. CRACK WILLOW — *Salix fragilis* Linnæus

FIG. 150. — Crack Willow.

This European species has been planted for ornament and distributed along streams by its brittle twigs which strike root readily, and has become naturalized in eastern North America from Newfoundland to Pennsylvania. It is a tall slender tree, sometimes 25 meters high, with a trunk up to 2 meters in diameter, though these dimensions are perhaps not reached by any individual outside of Europe. The name Crack willow is in allusion to the brittle-based twigs which are easily broken away, the rupture accompanied by a cracking sound.

The bark is rough and gray-brown,

thick; the young twigs are finely hairy, reddish or yellowish to brown, angular, becoming smooth and shining brown; the winter buds are 4 to 6 mm. long and smooth; the leaves are lanceolate, long-pointed, 8 to 15 cm. long, finely toothed, at least the lower teeth glandular; the blades are dark green on the upper side, pale green or whitish beneath, smooth on both surfaces, except when very young, when they are finely silky; their stalks are 6 to 16 mm. long, and usually bear one or more glands near the base of the blade; the stipules are glandular-toothed and usually fall away while the leaves are unfolding. The catkins appear in April or May on short leafy branches, and are from 2 to 7 cm. long, their axes hairy, their bracts blunt, a little hairy; the staminate flowers have a very short-stalked, smooth, narrowly ovoid ovary, the stigmas about as long as the very short style. In fruit the pistillate catkins elongate to 12 cm. or less; the capsules are narrowly ovoid, short-stalked, 4 to 5 mm. long.

The tree is also known as Redwood willow and Stag's-head willow; its wood is salmon red, and used in Scotland for small boats.

12. WHITE WILLOW — *Salix alba* Linnaeus

Salix vitellina Linnaeus

The White willow, or Huntingdon willow, has long been naturalized in eastern North America, introduced from Europe as a shade and ornamental tree, and it now appears in many places as much at home as if it were indigenous, from Nova Scotia and Ontario to North Carolina and Iowa, and occurs as far west as Idaho. It grows largest in wet soil, though it does very well on uplands, and reaches a maximum height of about 30 meters, with a trunk sometimes 2.5 meters thick.

The bark is gray to brown, rough and thick; the young twigs are yellowish green and finely hairy, becoming brown and smooth or nearly so by the end of their first season; the winter buds are narrowly ovoid smooth, bluntish, 5 or 6 mm. long. The lanceolate to oblong-lanceolate leaves are 5 to 13 cm. long, 8 to 16 mm. wide, finely glandular-toothed, usually long-pointed at the apex and narrowed at the base, silky-hairy on both sides at least when young, bright green on the upper side, much paler or whitish beneath; their stalks are 4 to 8 mm. long, sometimes bearing a gland or two near the base of the blade; the ovate-lanceolate stipules fall away soon after the leaves unfold. The catkins appear in April or May on short leafy branchlets, and are 3 to 6 cm. long, their bracts deciduous; the staminate flowers (staminate trees are very rare in North America)



FIG. 151. — White Willow.

have two stamens; in the pistillate flowers there is a narrowly ovoid smooth ovary with nearly sessile stigmas. The fruiting catkins are 5 to 7 cm. long, the smooth, nearly stalkless capsules ovoid-conic, 3 to 4 mm. long.

Its wood is preferred in England for cricket balls.

The Blue willow, *Salix carulea* J. E. Smith, also European, has been considerably planted for ornament, and is reported as locally established in the eastern States, but scarcely naturalized; it has bluish green leaves, nearly white on the under side.

13. WEEPING WILLOW—*Salix babylonica* Linnæus

The Weeping willow, so called from its drooping branches, is of Asiatic origin, but has been widely planted for ornament and for shade in Europe and North and South America; it has been distributed along streams and in valleys by means of its twigs, which take root readily in wet soil; it is now naturalized to a greater or less extent locally from Massachusetts to Michigan and Virginia. The tree sometimes becomes 20 meters high, with a trunk up to nearly 2 meters in diameter.

The bark is gray and rough, the young twigs slender, green to brown, smooth, characteristically drooping; the winter buds are sharp-pointed, light brown, 4 to 6 mm. long; the leaves are linear or linear-lanceolate, long-pointed, finely toothed, somewhat silky-hairy when unfolding, soon smooth on both sides, 6 to 18 cm. long, 5 to 12 mm. wide, rather bright green on the upper side, pale green beneath; their stalks are 6 to 12 mm. long, often hairy, sometimes glandular toward the base of the blade; the small stipules usually fall away early in the season. The catkins are borne on short, leafy branches of the season, flowering in April or May; they are small, 5 cm. long or less, slender, with ovate-lanceolate, slightly hairy bracts; there are 2 stamens in the staminate flowers (staminate trees are apparently unknown in North America); the ovary and smooth capsule are ovoid-conic, very short-stalked, the stigmas longer than the very short style.



FIG. 152. — Weeping Willow.

The Ring willow, occasionally planted, is a form of this species with curled leaves.

14. SANDBAR WILLOW — *Salix interior* Rowlee

Salix fluviatilis Sargent, not Nuttall. *Salix longifolia* Muhlenberg, not Lamarck

This is a river-valley species, preferring sandy soil, ranging from Quebec to Athabasca, south to Virginia, Kentucky, Nebraska, and Texas; over most of its

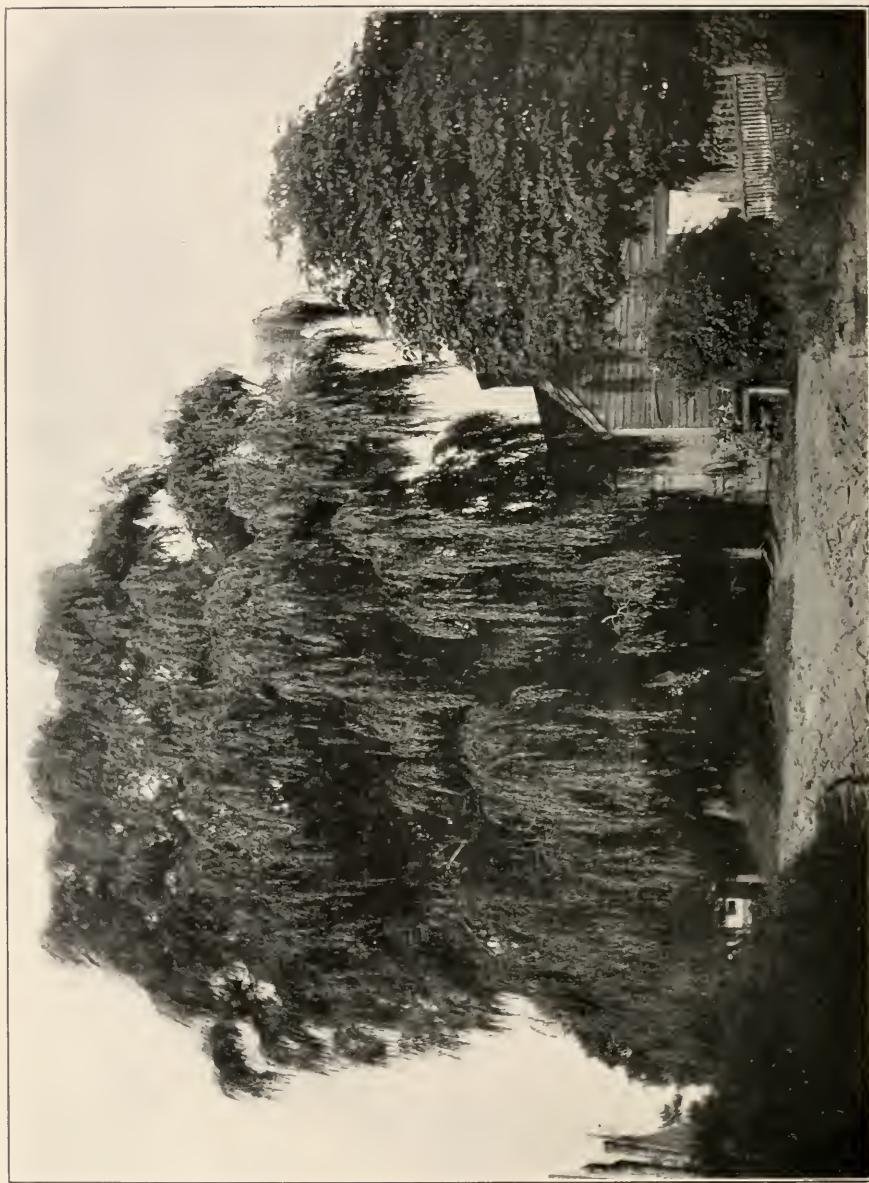


FIG. 153. — Weeping Willow, Sag Harbor, N. Y.

range it is a mere shrub, 5 meters high or less, or a very small tree, but westward it sometimes becomes a tree up to 20 meters high, with a trunk 6 dm. thick. *Salix fluviatilis* Nuttall, to which this plant has been referred by some authors, described originally from Oregon or Washington, appears to be distinct from it, and is not known to us to become a tree.

Its bark is brown, rather thin, nearly smooth; the slender young twigs are either smooth or finely hairy, reddish or purplish, becoming brown; the winter buds are ovoid, pointed, smooth, 3 or 4 mm. long. The linear-lanceolate or slightly oblanceolate leaves, often somewhat scythe-shaped, are 5 to 15 cm. long, 4 to 10 mm. wide, usually spinulose-toothed, pointed at both ends, usually smooth on both sides and bright green when old, but when young quite silvery-silky; their stalks are short, 6 mm. long or less, their stipules lanceolate to ovate, small, early falling. The stalked catkins, which



FIG. 154. — Sandbar Willow.

are from 2 to 5 cm. long, appear on leafy branchlets in April or May, their hairy bracts oblong to obovate, blunt, hairy, mostly entire-margined; the staminate flowers have 2 stamens with filaments somewhat hairy toward the base; the pistillate flowers have a narrowly oblong, usually hairy ovary, the lobed stigmas nearly sessile. The ripe fruiting catkins are 6 cm. long or less, the smooth ovoid-conic capsule very short-stalked, about 6 mm. long.

The wood is of little value, except for fuel or charcoal; it is soft, weak, light brown, and has a specific gravity of about 0.49, the sapwood nearly white. Seedling plants of this species sometimes have lacinate leaves.



FIG. 155. — Slender Willow.

15. SLENDER WILLOW —

Salix exigua Nuttall

Salix fluviatilis exigua Sargent. *Salix lutescens* Rydberg

The Slender willow inhabits river-shores and the borders of lakes from Wyoming to Athabasca, British Columbia, Colorado, Nebraska, Texas, and southern California, thus extending over nearly the whole of the western United States and of southwestern British America. It is closely related to *Salix interior*

Rowlee, of the eastern part of the country, and takes its place in the West. While usually a mere shrub not over 2 meters high, it occasionally forms a tree in the Southwest, reaching a height of 7 meters or more.

It differs from the Sandbar willow in usually having smaller leaves with much less prominent teeth, often, indeed, nearly entire-margined, and the silky hairs which cover them and the twigs in the young stages are usually retained much later in the season, sometimes until the leaves are quite mature. The catkins, flowers, and capsules are very similar indeed to those of its eastern relative.

16. SILVER-LEAVED WILLOW — *Salix sessilifolia* Nuttall

Salix argophylla Nuttall. *Salix fluviatilis argophylla* Sargent

This is another close relative of the Sandbar willow and of the Slender willow; it inhabits much the same range as the latter, being known along rivers and streams from Montana to Washington, Colorado, New Mexico, and California. Like the two related species it is usually shrubby, but it occasionally becomes a small tree, up to 10 m. high, with a trunk 3 dm. thick.



FIG. 156. — Silver-leaved Willow.

It differs from both in having leaves silvery-silky on both sides, even when mature; otherwise they are like those of the Slender willow, being often entire-margined or nearly so, and the capsules are silky, even when ripe; there appear to be intermediate forms, which have only slightly silky capsules, however, which may connect the two. The Californian *Salix Hindsiana* Ben-

tham is doubtfully distinct from it.

The wood is soft and weak, reddish, with a specific gravity of 0.44, and is used in the Northwest for basketry.

17. MACKENZIE'S WILLOW — *Salix Mackenzieana* Barrett

Salix cordata Mackenzieana Hooker

Mackenzie's willow occurs on the shores of lakes and streams from Manitoba to Idaho and California. It is a small tree, becoming as much as 9 meters high, often shrubby, however, and of close affinity to the widely distributed shrub *Salix cordata* Muhlenberg.

Its bark is brown, nearly smooth, the young twigs smooth or very nearly so,

reddish or purplish, the winter buds flattened, pointed, smooth, about 3 mm. long. The leaves vary from lanceolate to oblanceolate, and from 5 to 10 cm. long by 1 to 2.5 cm. wide; they are finely bluntly toothed or almost or quite entire-margined, pointed or long-pointed at the apex, usually narrowed at the base, dark green on the upper surface, pale green beneath, smooth on both sides when old, but more or less hairy when young; their slender stalks are 8 to 12 mm. long; their stipules kidney-shaped, 2 to 5 mm. broad, usually remaining until the leaves fall in the autumn. The catkins, which appear from April to early June, according to latitude, are at the ends of short leafy branches of the season, 4 to 6 cm. long, their persistent bracts obovate, acutish, hairy toward the base; the staminate flowers have 2 stamens with smooth filaments, and the ovary in the pistillate flowers is ovoid, long-stalked, smooth, the short style about as long as the notched stigmas. The fruiting catkins are 7.5 cm. long or less, the ovoid beaked smooth capsules 5 to 7 mm. long, their filiform stalks 3 to 4 mm. long.



FIG. 157. — Mackenzie's Willow.

Mackenzie's willow is ornamental and well worthy of planting in wet grounds. *Salix cordata*, the Heart-leaved willow, a shrub, widely distributed from New Brunswick to British Columbia, Virginia, Missouri, and California, has leaves mostly heart-shaped or rounded at the base, very variable in width, and smaller, shorter-stalked capsules.

18. MISSOURI WILLOW — *Salix missouriensis* Bebb

Salix cordata vestita Andersson

The Missouri willow is known in the valleys of the Missouri and Mississippi rivers and of tributary streams, from Kentucky, Illinois, and Missouri to Iowa and Nebraska. It becomes 17 or 18 meters high, with a trunk up to 4.5 dm. thick.

The bark is gray, thin, and scaly, the young twigs green to greenish brown, densely velvety-hairy, becoming brown and smooth; the winter buds are densely hairy, somewhat flattened, pointed, very large, sometimes 2 cm. long. The leaves are lanceolate, varying to somewhat oblanceolate, pointed, often long-pointed at the apex, blunt or somewhat heart-shaped or narrowed at the base, 15 cm. long or less, 1 to 3 cm. wide, rather finely toothed, hairy on both sides when young, but when mature dark green on the upper surface, very pale green or whitish, more or less hairy, and rather prominently netted-veined beneath; their stalks are stout, hairy, 8 to 15 mm. long, their stipules obliquely ovate, toothed, netted-



FIG. 158. — Missouri Willow.

veined, 6 to 12 mm. long, remaining until the fall of the leaves or earlier deciduous. The catkins are borne at the ends of very short, few-leaved branchlets and flower in March or April before the leaves unfold, or at the time they are unfolding; they are from 2 to 5 cm. long, their bracts blunt, hairy, persistent in the pistillate ones; the staminate flowers have two smooth stamens, the pistillate a smooth, slender-stalked ovary, the notched stigmas about as long as the short style. In fruit, the pistillate catkins become 6 to 10 cm. long, the smooth, narrowly ovoid-conic capsules 6 to 8 mm. long, their filiform stalks 3 to 6 mm. long.

The wood is more durable, and therefore more valuable than that of most other willows, and is used for posts; it is soft, weak, reddish brown, the sapwood much lighter in color than the heart.

19. CALIFORNIA WHITE WILLOW — *Salix lasiolepis* Benth

Salix Bigelovii Torrey

Inhabiting banks of rivers, streams, and lakes, the California white willow ranges nearly throughout that State, extending into Nevada and Arizona, and perhaps northward into southern Oregon. It is often a shrub, but sometimes forms a tree up to 15 or 16 meters in height in southern California.

Its bark is brown, rather thin, more or less fissured; the young twigs at first velvety and yellow or reddish, becoming smooth and dark brown or reddish brown; the winter buds are smooth or a little hairy, flattened, pointed, 5 to 7 mm. long. The leaves are mostly oblanceolate, varying to oblong-lanceolate, 6 to 10 cm. long, 1 to 2 cm. wide, or those of young shoots sometimes larger; they are pointed or bluntish at the apex, narrowed or rounded at the base, hairy on both sides when young, but smooth and dark green on the upper surface when mature, the under side pale green or whitish and more or less hairy, rather prominently netted-veined; their stalks are 5 to 12 mm. long, the stipules ovate, hairy, usually very small and falling away soon after the leaves unfold, rarely larger and persistent. The catkins are 3 to 4 cm. long, and flower in February or March before the leaves unfold, their bracts brown, hairy,



FIG. 159. — California White Willow.

persistent at the base of the stalk of the capsules; the 2 stamens of the staminate flowers have smooth filaments united toward the base; the ovary in the pistillate flowers is narrowly ovoid-conic, smooth, rather short-stalked, the very short style about as long as the stigmas. The fruiting catkins are about 5 cm. long, the smooth, narrowly ovoid capsules about 5 mm. long.

The wood is soft and weak, light brown, with a specific gravity of about 0.56, and is used for fuel and basketry. The tree is known also as Bigelow's willow and as Western yellow willow.

20. BALSAM WILLOW — *Salix balsamifera* (Hooker) Barrett

Salix cordata balsamifera Hooker. *Salix pyrifolia* Andersson

The Balsam willow, so called from the balsamic odor of its foliage, is widely distributed as a shrub, usually not over 3 meters high, from Newfoundland to Manitoba, Athabasca, New York, and Minnesota, reaching high altitudes in the mountains of New England, and has only been observed to become a tree in Maine, attaining there a height of about 8 meters, with a trunk up to 3 or 4 dm. in diameter.

Its bark is described as gray and nearly smooth; the very young twigs are puberulent, soon becoming smooth, purplish or brown, and shining; the winter buds are flattened, pointed, smooth, shining red or purple, 4 to 6 mm. long. The thin leaves, which vary from ovate to elliptic or ovate-lanceolate, or sometimes slightly obovate, are a little hairy when unfolding, soon becoming smooth on both sides, 5 to 10 cm. long, 2 to 4 cm. wide, pointed or some of them blunt at the apex,



FIG. 160. — Balsam Willow.

rounded or somewhat heart-shaped at the base, dark green on the upper side, pale and prominently netted-veined beneath, finely glandular-toothed; their slender stalks are 6 to 15 mm. long, finely hairy when young, becoming smooth and yellow; the stipules are usually very small and fall away when the leaves unfold, or perhaps sometimes not developed at all, but they are occasionally larger on leaves of strong shoots. The catkins are from 3 to 4 cm. long, flowering when the leaves unfold in May or June, borne on short, few-leaved branchlets of the season, their bracts pink and long-hairy, persistent; the staminate flowers have 2 stamens with smooth filaments; the pistillate ones have a long-stalked, smooth ovary, the notched stigmas nearly sessile. In fruit the pistillate catkins become from 5 to 7.5 cm. long, the narrowly ovoid-conic smooth capsules 4 or 5 mm. long, their stalks usually more than one half as long.

21. LARGE-LEAVED ALASKAN WILLOW — *Salix amplifolia* Coville

This species is known only from Alaska, where it inhabits coastal sand-dunes; it forms either a shrub or a small tree, the largest individuals recorded being about 8 meters high, with trunks about 3 dm. in diameter.



FIG. 161. — Large-leaved Alaskan Willow.

The young twigs are stout, densely hairy, and remain more or less hairy for two or three years, becoming purple. The leaves are oval to obovate, 8 cm. long or less, 4 to 6 cm. wide, blunt or short-pointed at the apex, mostly rounded at the base, finely toothed or entire-margined, white silky-hairy on both sides when young, but becoming nearly or quite smooth when very old; they have short hairy stalks 1 cm. long or less. The catkins appear on short, leafy branches of the season; they are 4 to 6 cm. long, 1.5 cm. thick, and flower in June, developing with the leaves; their bracts are dark brown and persistent; the staminate flowers have two stamens with smooth filaments, and the pistil-

late ones have a hairy-stalked, smooth, narrow ovary, a very slender style 2 to 4 mm. long, the deeply 2-lobed stigmas about 1 mm. long. The fruiting catkins become 2 cm. thick and about 8 cm. long, the smooth, narrowly ovoid capsules 8 to 9 mm. long.

22. HOOKER'S WILLOW — *Salix Hookeriana* Barrett

Hooker's willow inhabits sand-dunes along the coast from British Columbia to Oregon, sometimes growing almost within the influence of salt water. While often a shrub, it sometimes forms a tree up to 16 meters high, with a trunk 3 dm. thick or more.

The thin, brown bark is slightly fissured, the young twigs densely velvety-hairy, and remain more or less so during parts of two seasons, becoming purple-brown and smooth; the winter buds are hairy, pointed, about 5 mm. long. The leaves are obovate to oblong-obovate, bluntly finely toothed or entire-margined, blunt or short-pointed at the apex, narrowed at the base, usually 5 to 8 cm. long and 2 to 4.5 cm. wide, but those of strong shoots sometimes 15 cm. long; they are very hairy when young, and more or less



FIG. 162. — Hooker's Willow.

shoots sometimes 15 cm. long; they are very hairy when young, and more or less

hairy when mature, the upper side bright green, the under surface pale green or whitish; their densely hairy stalks are 1 cm. long or less, sometimes becoming less hairy when old; the stipules are small and fall away early. The catkins appear on twigs of the previous season, are 2.5 to 4 cm. long, with hairy persistent bracts, and flower before the leaves unfold in April or May; the staminate flowers have 2 stamens with smooth filaments; the pistillate flowers have a slender-stalked, narrowly ovoid-conic, smooth ovary and a slender style longer than the stigmas. The capsules are smooth, stalked, about 5 mm. long.

Its wood is soft, light brown, with a specific gravity of about 0.53.

23. OSIER WILLOW — *Salix viminalis* Linnæus

This small tree, native of Europe and Asia, has been planted in the eastern United States for use in wickerware and for ornament, and has escaped from cultivation and locally established itself from Newfoundland to Pennsylvania. While often a shrub with long upright branches, it occasionally assumes arborescent form, becoming 6 or 7 meters high, with a trunk 1.5 dm. thick.

The bark is brown and nearly smooth, the branches long and wand-like, the young twigs round, finely puberulent, becoming smooth and yellow-green; the winter buds are puberulent, pointed, 4 or 5 mm. long. The narrowly linear-lanceolate leaves are 7 to 15 cm. long, 4 to 16 mm. wide, long-pointed at the apex, narrowed at the base, entire-margined, dark, dull green and smooth on the upper side, densely and persistently silvery-silky on the under surface; their stalks are finely hairy, 1 cm. long or less, their stipules narrowly lanceolate, early falling. The catkins are nearly or quite stalkless on twigs of the preceding season, 3 or 4 cm. long, and flower before the leaves unfold in April or May; their bracts are dark-colored at the apex and silky-hairy; the staminate flowers have 2 stamens, the pistillate ones a very short-stalked woolly ovary, a slender style usually as long as the notched stigmas. The ripe fruiting catkins are 6 cm. long or less, about 1 cm. thick, the very short-stalked capsules densely silky-hairy, narrowly conic, 4 to 5 mm. long.

This willow is considered the most valuable species for basketry, and is extensively cultivated for that purpose in Europe and to some extent in the United States.



FIG. 163. — Osier Willow.

24. YEW-LEAVED WILLOW — *Salix taxifolia* Humboldt, Bonpland and Kunth

This interesting species, very different in aspect and in foliage from other willows, grows along streams in southern Arizona and Texas, south through Mexico to Guatemala, and is reported to occur in Lower California. It is a tree 18 meters high or less, with a trunk up to 4 or 5 dm. in diameter.



FIG. 164. — Yew-leaved Willow.

The thick bark is gray and much fissured, the young twigs densely and finely hairy, becoming smooth and purplish; the winter buds are pointed, finely hairy, about 3 mm. long. The leaves are much smaller than those of any other North American tree willow, being only 3 cm. long or less, and 2 to 3 mm. wide; they are linear, pointed at both ends, entire-margined or with a few low teeth, whitish-hairy on both sides when young, becoming dull and rather dark green and smooth or nearly so on the upper side when mature, but remaining more or less hairy beneath; their stalks are very short, not over 2 mm. long, and the ovate or ovate-lanceolate hairy pointed stipules are about as long as the leaf-stalks and either fall away early or remain until the leaves are fully grown. The catkins are borne at the ends of short branches, are 1 to 1.5 cm. long, and flower in Arizona in May, in southern Mexico in January, their oblong-pointed hairy bracts early falling; the staminate flowers have 2 stamens with filaments hairy toward the base; in the pistillate flowers the ovary is hairy, the lobed stigmas longer than the very short style. The fruiting catkins become 1 to 2 cm. long, the usually densely hairy capsules ovoid-conic, 5 to 6 mm. long.

The tree was first known to Europeans in Mexican gardens. Trees in the Limpia Cañon, Texas, have much less hairy capsules than those in central and southern Mexico.

25. SATIN WILLOW — *Salix sitchensis* Sanson

This showy species inhabits moist or wet soil from Alaska to southern California, most abundant near the coast; while usually a shrub it sometimes forms a tree, attaining a maximum recorded height of about 13 meters in Oregon, with a trunk 3 or 4 dm. thick. It is also called Silky willow, Sitka willow, and Silver willow.

Its bark is thin, brown, nearly smooth or somewhat scaly; the young twigs are densely hairy, orange-colored, becoming smooth, and red to brown, the winter buds hairy, pointed, 5 to 7 mm. long. The leaves are obovate or oblanceolate, mostly

quite entire-margined, pointed or blunt at the apex, narrowed at the base, 4 to 12 cm. long, 2 to 5 cm. wide, hairy on both sides when very young, persistently satiny or silvery-hairy on the under side but dark green and nearly smooth on the upper surface when mature; their hairy stalks are 1 cm. long or less, their stipules broad, glandular-toothed, white-hairy, at least beneath, early falling away. The catkins are borne on short, few-leaved branches of the season and flower while the leaves are unfolding, from March to June according to latitude; they are from 3 to 6 cm. long, with yellowish hairy bracts; the staminate flowers have only one stamen, its filament smooth (2 stamens with partly united filaments are recorded as rarely observed); the pistillate flowers have a hairy ovoid ovary with a very short stalk, the slender style two or three times as long as the stigmas. In fruit the pistillate catkins become 8 cm. long or less, the woolly or hairy capsules 5 to 6 mm. long.



FIG. 165. — Satin Willow.

The wood of the Satin willow is light red, soft and weak, with a specific gravity of 0.51. The satiny under surfaces of its leaves make it a strikingly beautiful plant.

The wood of the Satin willow is light red, soft and weak, with a specific gravity of 0.51. The satiny under surfaces of its leaves make it a strikingly beautiful plant.

26. BEBB'S WILLOW — *Salix bebbiana* Sargent

Salix rostrata Richardson, not Thuillier

Bebb's willow, named in honor of the late M. S. Bebb, a diligent student of willows, grows in various situations, preferring wet soil, from Anticosti to Hudson bay and Alaska, south to New Jersey, Pennsylvania, Illinois, Nebraska, New Mexico, and Oregon, being one of the most widely distributed species. It is a shrub or small tree, occasionally 8 meters high, with a trunk 2 dm. thick or less.

The thin reddish green bark is scaly, the young twigs very hairy, becoming smooth and purplish or brown, the winter buds narrow, bluntish, puberulent, about 5 mm. long. The leaves are elliptic to oblong-lanceolate, or sometimes broadest a little above the middle, 2.5 to 7 cm. long, 2.5 cm. wide or less, sparingly toothed or entire-margined, pointed at the apex or some of them blunt, narrowed or rounded at the base, pale green, rather prominently netted-veined and hairy on the under side, dull green and smooth or merely puberulent above, sometimes nearly smooth on both sides when very old; their stalks are from 4 to 12 mm. long, and usually hairy, their stipules half heart-shaped, pointed,



FIG. 166. — Bebb's Willow.

glandular-toothed, sometimes 1 cm. long or more, and usually fall away early. The catkins are 2 to 3 cm. long, borne on very short few-leaved branchlets, and flower while the leaves are unfolding or before, in April or May; their bracts are blunt, hairy, yellow, with pink tips, those of the pistillate catkins persistent; the staminate flowers have 2 stamens with smooth filaments; in the pistillate flowers the hairy ovary is stalked, the notched stigmas sessile on its apex. The fruiting pistillate catkins become 5 cm. long or less, the narrowly ovoid-conic beaked capsules 6 or 7 mm. long, their filiform stalks usually about one half as long.

27. BAKER'S WILLOW — *Salix Bakeri* von Seemen

This recently described Californian species grows along streams in the west-central parts of the State and has been confused with *Salix lasiolepis* Benthams, which it much resembles, but its capsules are hairy toward the top; it attains a height of 10 meters or more, and is reported to extend northward into Oregon, and there to become twice that height.

The young twigs are finely puberulent, soon becoming smooth and dark brown; the winter buds are ovoid, puberulent, pointed, about 4 mm. long. The leaves are oblanceolate, or some of them oblong-lanceolate, 4 to 7 cm. long, 1 to 1.5 cm. wide, pointed at both ends or some of them blunt at the apex, smooth, bright green and somewhat shining on the upper side, pale, hairy, and rather prominently veined beneath, the margins entire or with a few low teeth; the puberulent leaf-stalks are 1 cm. long or less, the stipules small, obliquely oblong, hairy beneath, sometimes persistent. The catkins appear before the leaves on twigs of the preceding season, and flower in March or April; they are very short-stalked, with a few small leaves at the base, 2 to 4 cm. long, about 1 cm. thick, their



FIG. 167. — Baker's Willow.

very hairy bracts obovate, brown, blunt, persistent; there are 2 stamens with smooth, separate filaments in the staminate flowers, and the pistillate ones have a narrowly ovoid ovary which is loosely hairy, at least toward the top, the style longer than the notched stigmas. The fruiting catkins become 6 cm. long or less, the somewhat hairy capsules 4 or 5 mm. long, their stalks about 1.5 mm. long.

28. GLAUCOUS WILLOW — *Salix discolor* Muhlenberg

Known also as Pussy willow, Silver willow, and Swamp willow, this shrub or small tree inhabits swamps, stream-banks, and moist hillsides from Nova Scotia to Delaware, Ontario, Manitoba, and Missouri. It seldom becomes a tree, usually being a shrub not over 5 meters high, but trees up to 8 meters high have been observed with trunks up to 3 dm. in diameter.

Its bark is reddish brown, thin, somewhat scaly. The young twigs are somewhat hairy, purple, soon becoming smooth, the winter buds purplish and shining. The leaves are oblong to oblong-lanceolate or obovate-oblong, 12 cm. long or less, 1.4 to 4 cm. wide, more or less hairy on the under side when young, smooth on both sides when mature, dark green above, whitish or glaucous beneath, pointed at both ends, the margin toothed or nearly entire; their stalks are 6 to 24 mm. long, their stipules obliquely lanceolate or half heart-shaped, and usually fall away before midsummer. The catkins are borne on the sides of twigs of the previous season and flower in March or April, long before the leaves unfold; they are densely flowered, 4 to 5 cm. long, their bracts brown-tipped and long-silky; the staminate flowers have 2 stamens with separate filaments; the pistillate flowers have a stalked oblong-conic hairy ovary, a short style and undivided stigmas. The narrowly ovoid-conic capsules are 5 to 8 mm. long, and quite hairy.

While naturally preferring wet soil, this willow grows well when planted on upland, and well-developed bushes are handsome and interesting.

Salix eriocephala Michaux, a closely related shrub, has the young branches densely hairy, and thicker leaves with prominently toothed margins.



FIG. 168. — Glaucois Willow.

29. SCOULER'S WILLOW — *Salix Scouleriana* Barrett

Salix flavescens Nuttall, not Host. *Salix brachystachys* Benthann. *Salix Nuttallii* Sargent

Scouler's willow inhabits moist soil from the valley of the Yukon River to British Columbia, southern California, Colorado, and New Mexico, reaching under

favorable conditions near the Pacific coast a height of 20 meters or more, with a trunk up to 7 dm. in diameter; at higher altitudes and in its eastern range it is much smaller, however, and on the mountains is a mere shrub, 4 meters high or less.

Its dark brown bark is thin and rough. The young shoots are pubescent or



FIG. 169. — Scouler's Willow.

puberulent, yellowish to orange, becoming dark brown and smooth, the winter buds 5 to 7 mm. long, pointed, quite densely hairy or sometimes smooth or nearly so. The leaves are oblanceolate to obovate, 10 cm. long or less, pointed at the apex, narrowed toward the somewhat wedge-shaped base, entire-margined or sparingly crenate; they are hairy on both sides when young, often densely hairy on the under side, but when mature the upper surface is dark green, smooth and somewhat shining, the under side much paler, per-

manently hairy or nearly or quite smooth; their stalks are finely hairy, 6 to 12 mm. long, their stipules small, often glandular-toothed and usually fall away soon after they appear in the spring. The catkins flower at the time of unfolding of the leaves from March to May, according to latitude and altitude; they are nearly cylindric, 2.5 to 4 cm. long, their scales whitish hairy, pointed, brownish, those of the pistillate catkins persistent; the staminate flowers have 2 separate smooth filaments, the pistillate ones have a pointed densely hairy stalked ovary with a short style, which ripens into a narrowly ovoid-conic beaked capsule about 8 mm. long.

The tree is planted for ornament on the Pacific coast. Its wood is soft and light, reddish brown, with a specific gravity of about 0.50, and is used for fuel, charcoal, and tool-handles.

30. FELT-LEAF WILLOW — *Salix alaxensis* (Andersson) Coville

Salix speciosa Hooker and Arnott, not Host. *Salix speciosa alaxensis* Andersson

The Felt-leaf willow, so called from the felty white covering of its under leaf-surfaces, grows only in Alaska and eastern Siberia and is largest and most abundant near the coasts, attaining a maximum height of about 10 meters, with a trunk up to 1.5 dm. in diameter or more. It is often shrubby, however, sometimes flowering when not over a meter high.

The young twigs are very densely white-hairy, stout, becoming smooth or nearly

so, and purplish after the first season. The leaves are elliptic-lanceolate to somewhat obovate, 10 cm. long or less, 2 to 4 cm. wide, pointed at both ends or bluntish at the apex, when young hairy on both sides, and especially so beneath, and minutely glandular-toothed, when mature entire-margined, smooth and light green on the upper side, persistently white-felty beneath; the stout, hairy leaf-stalks are 1.5 cm. long or less, the narrowly lanceolate hairy stipules 1 to 2 cm. long. The catkins appear in May or June and flower before the leaves unfold or while they are unfolding; they are nearly stalkless, 2 to 7 cm. long, their bracts long-hairy, ovate, blunt; there are 2 sta-

mens in the staminate flowers with separate filaments; the pistillate flowers have a narrowly ovoid-conic woolly short-stalked ovary and a filiform style much longer than the stigmas. The capsules are woolly, very short-stalked, about 6 mm. long.

Salix longistylis Rydberg, of the Yukon Territory, differs from this species in having the twigs devoid of hairs; it is not known to grow more than 4 meters high.



FIG. 170. — Felt-leaf Willow.



FIG. 171. — Purple Willow.

31. PURPLE WILLOW —

Salix purpurea Linnæus

The Purple willow is native in Europe; it has been introduced into eastern North America for ornament and for osiers, and has locally escaped from cultivation in the eastern and middle States and perhaps in Ontario. While usually a shrub, it occasionally forms a small tree up to 4 meters high. It is also called Bitter willow, Rose willow, and Whipcord willow.

Its twigs are purple, slender, and flexuous. The leaves are oblanceolate, pointed at the apex, narrowed at the base, toothed, 4 to 7 cm. long, 10 mm. wide or less, rather

dark dull green on the upper side, pale green or whitish beneath, smooth on both surfaces; their stalks are about 6 mm. long, smooth, not glandular, their stipules very small, and fall away early. The catkins are borne on twigs of the preceding season, and flower in April or May before the leaves unfold; they are nearly or quite stalkless and from 2 to 5 cm. long, their bracts blunt, purple, hairy, and persistent; the staminate flowers have two hairy stamens, their filaments and sometimes also the anthers united. The capsules are hairy, stalkless, and the stigmas sessile.

THE BAYBERRY FAMILY

MYRICACEÆ Dumont



HIS family consists of 2 genera, with about 35 species of shrubs or small trees of wide geographic distribution in warm and temperate regions. They are of no special economic value; the bark of some has been used for dyestuffs and in medicine, and the juicy fruit of several Asiatic species is eaten in China and Japan.

The Myricaceæ have alternate, evergreen or deciduous, leathery, resinous-punctate, aromatic leaves, without stipules. The flowers are diœcious, sometimes monœcious, in catkins developed at the axils of the leaves of the previous season, from buds formed during the summer and expanding in early spring. The staminate flowers are in elongated, solitary, fasciculate or paniculate catkins, the flowers consisting of 2 to 8 stamens borne on the thickened base of a scale, their filaments slender, short, somewhat united at the base; anthers ovate, erect, 2-celled, hairy, opening lengthwise; the ovary is rudimentary. The pistillate catkins are short, ovoid, or globose; the flowers are single or in pairs at the base of the scales, consisting of 2 united carpels forming a sessile 1-celled ovary, at the axil of a scale, subtended by 2 small bracts and surrounded by 2 to 8 short or long bractlets; the style is short, divided into 2 thread-like stigmas; ovules solitary, erect. The fruit is globose, drupe-like, often surrounded by a waxy excretion; the nut is hard, thick-walled, the seed erect, embryo central, and straight; endosperm none.

The genus *Comptonia*, with one species, *C. peregrina* (Linnæus) Coulter, a low, aromatic shrub of eastern North America, known as the Sweet fern, and the genus *Myrica* Linnæus, of which *M. Gale* is the type, and of which seven species occur in North America, constitute the family. *Myrica* is the ancient name of a shrub, probably not a member of this family.

A wax formerly much used for candle-making and in domestic medicine is obtained by boiling the fruits of *M. cerifera* Linnæus and of the shrubby *M. carolinensis* Miller, in water.

Our arborescent species of *Myrica* are:

Flowers diœcious; southeastern trees.

Leaves oblong-spatulate, usually serrate, yellow-green, glandular beneath. 1. *M. cerifera*.

Leaves oblong-obovate, entire, dark green, punctate beneath. 2. *M. inodora*.

Flowers monœcious; Pacific coast tree. 3. *M. californica*.

1. WAX MYRTLE — *Myrica cerifera* Linnaeus

A small aromatic evergreen tree or shrub inhabiting sandy soils from Delaware to Florida and through the Gulf States to Texas and Arkansas, occurring mostly near the coast; also in the West Indies and Bermuda. It is also called Bayberry, Waxberry, Candleberry, Myrtle tree, and Puckerbush, and attains a maximum height of 12 meters, with a trunk diameter of 3 dm.

The slender branches are usually nearly erect; as a shrub it often forms extensive thickets. The bark is about 6 mm. thick, smooth, and gray. The twigs are slender, rusty-hairy, and glandular, becoming smooth, shining, red or gray-brown, and dark brown when old, the leaf buds pointed, 3 mm. long. The leaves are thick, firm, and fragrant, oblanceolate or oblong-spatulate, 5 to 10 cm. long, more or less pointed at the apex, wedge-shaped and tapering at the base, sparingly toothed or sometimes entire, resinous, yellowish green, smooth, with a prominent midrib above, paler, with dark yellow glands and more or less short-hairy beneath; the leaf-stalk is slender, 5 to 15 mm. long. The flowers, which are dioecious, appear in early spring. The staminate catkins



FIG. 172. — Wax Myrtle.

are about 1.5 cm. long, with ovate or kidney-shaped, sharp-pointed, and fringed scales; the stamens have filaments united for about half their length; anthers oblong, notched above. The pistillate catkins are about half the length of the staminate; the ovary is surmounted by two slender styles projecting beyond the scales and stigmatic on their inner faces. The fruit ripens in autumn in short spikes, sometimes densely clustered around the twigs, to which they remain attached until spring; the drupe is globose, 2 to 3 mm. in diameter, thickly covered with bluish white wax, enclosing the small bony nut; seed oblong, small, and pale brown.

The wood of the Wax myrtle is soft, brittle, close-grained, dark brown. Its specific gravity is about 0.56. It is probably used only for fuel. The leaves mostly persist during the winter; those of young plants are sometimes very coarsely and sharply toothed.

2. ODORLESS MYRTLE — *Myrica inodora* Bartram

Occasionally a tree, but usually a low, odorless evergreen shrub, inhabiting pine-land ponds, and swamps near the coast, in northwestern Florida, Alabama, and Mississippi, apparently extremely local. It attains a height of 6 meters, with a trunk diameter of about 9 cm.

The trunk is straight and slender, with upright branches. The bark is thin, close, smooth, and almost white. The twigs are stout, densely hairy when young, becoming smooth or nearly so and bright brown. The leaf-buds are ovoid, about 5 mm. long, sharp-pointed. The leaves are leathery, closely and finely punctate, oblong-obovate, elliptic-obovate or spatulate, 4 to 8 cm. long, blunt at the apex, narrowed at the base, usually quite entire, seldom sparingly toothed at the upper end, dark green and very glossy above, dull green with a prominent midrib beneath; the very short leaf-stalk is slightly margined. The flowers are diœcious, opening from March to May; staminate catkins stout, 1 to 1.5 cm. long, their scales orbicular or ovate, nearly as broad as long, hairy fringed, the filaments short, united at the base; anthers oblong, slightly notched, yellow, and slightly projecting beyond the scales. The pistillate catkins are slender and elongated; scales loosely imbricated, orbicular-ovate, broader than long, each usually bearing two flowers; ovary ovoid, hairy, the styles 2, bright red, spreading and projecting beyond the scales; the rachis continues to lengthen after flowering, sometimes becoming 5 cm. long. The fruit, which is not abundantly produced, is globose, 5 to 7 mm. in diameter, often solitary, its waxy coating thin; shell of the nut thick and bony; seed oblong or oblong-obovoid, sharp-pointed, 3 mm. long, and yellowish brown.



FIG. 173. — Odorless Myrtle.

3. CALIFORNIA BAYBERRY — *Myrica californica* Chamisso

This evergreen tree, also called California wax myrtle, California myrtle, Wax myrtle, Myrtle, and Bayberry, occurs on the Pacific coast from Los Angeles, California, northward to Washington, growing in sand-dunes along salt marshes, or on hillsides, attaining its largest dimensions, 12 meters high, with a trunk diameter of 4 dm., in California. It is usually smaller and often a mere shrub.

The branches are short and ascending, forming a rather compact tree. The bark is about 2 mm. thick, smooth and close, dark gray or gray-brown, and reddish within. The twigs are stout, hairy, and dark green, becoming rather smooth, red-brown, and finally light gray. The leaves are thin in texture, oblanceolate or oblong-lanceolate, 5 to 10 cm. long, sharp-pointed, wedge-shaped at the base,

thick, revolute, and sharply toothed on the margins, except toward the base, very glandular when unfolding, soon becoming dark green and shining above, yellowish green, smooth or nearly so, with small black glands and prominent midrib beneath; the leaf-stalk is usually less than 1 cm. long. The flowers are monœcious,



FIG. 174. — California Bayberry.

both kinds appearing on the same twigs and frequently in the same catkins, from April to June, according to latitude. The staminate catkins are often 2.5 cm. long; their scales are ovate, sharp-pointed, hairy, with a pair of small bractlets at the base; stamens about 16, their filaments united below; anthers oblong, slightly notched and projecting beyond the scales. The pistillate catkins are above the staminate ones, with often a few catkins bearing both kinds of flowers occurring between them; the ovary is ovoid, narrowed into 2 slender, red, exserted styles, stigmatic on their inner faces. The fruit ripens from August to October in short, crowded, spike-like clusters, falling off during the winter. It is globose, 5 mm. in diameter, purple, its waxy covering

thin; seed brown.

The wood of the California bayberry is very hard, brittle but strong, close-grained, grayish or reddish brown; its specific gravity is about 0.67. It is used for cabinet work and in turnery. The bark and leaves are locally used in domestic medicine.

It is sometimes planted in California in parks and gardens.

THE CORKWOOD FAMILY

LEITNERIACEÆ Drude



THE family consists of but a single genus, with one known species, a small tree or shrub of the south central United States. It is of no economic value.

The Leitneriaceæ have alternate, somewhat leathery, deciduous leaves, without stipules. The flowers are diœcious, borne in catkins, which appear before the leaves from buds formed the previous season. The staminate catkins have taper-pointed concave imbricated bracts, on a stout, hairy rachis; the flowers have no perianth; the 3 to 12 stamens are borne upon a curved receptacle, their filaments slender or awl-shaped and incurved, the anthers oblong, notched at the apex, and face inward. The pistillate flowers are in shorter, more slender catkins, their bracts less taper-pointed; a rudimentary perianth of minute glandular scales surrounds the ovary, which is composed of a single carpel, ovoid, hairy, and 1-celled, terminated by an oblique elongated flattened style, stigmatic on the outer surface; ovule solitary. The fruit is a cluster of compressed drupes, subtended by the scarcely altered bracts. The embryo has 2 oblong cotyledons slightly cordate at the base; endosperm fleshy.

CORKWOOD

GENUS **LEITNERIA** CHAPMAN

Species ***Leitneria floridana*** Chapman



PECULIAR small tree or shrub, confined to swamps in southern Missouri, Florida, and Texas, spreading widely by thick, stolon-like branches just beneath the surface of very wet soil. It attains a height of 7 meters, with a trunk diameter of 14 cm.

The trunk is straight and slender, much enlarged near the base, from which it gradually tapers upward. The branches are spreading, forming a rather open tree. The thin bark is 1.5 mm. thick, gray to brown, slightly fissured and somewhat ridged. The twigs are stout, round and pithy, bright green or reddish, densely hairy, becoming smooth after the first year, red-brown and marked with triangular leaf-scars; the terminal buds are conic, 3 mm. long, their several scales oblong, imbricated, densely hairy; the lateral buds are smaller. The leaves are thick and firm, narrowly elliptic, oblong or elliptic-lanceolate, rarely oval, 1 to 2 dm. long, sharp-pointed or the lower blunt, gradually narrowed at the base,

entire and revolute on the margin, bright green, shining, and smooth, except along the prominent veins, above, pale, hairy, and prominently reticulated beneath; the leaf-stalk is stout, grooved, and hairy, 4 to 6 cm. long. The staminate catkins are cylindric, 3 to 4 cm. long; the bracts broadly ovate, 4 to 5 mm. long, taper-pointed, bright brown, the anthers light yellow. The pistillate catkins are smaller, their bracts ovate, sharp-pointed; ovary hairy; stigma somewhat leaf-like. Drupes elliptic, about 2 cm. long, somewhat compressed on one side, rounded



FIG. 175. — Corkwood.

on the other, pointed at the apex, bright brown and wrinkled; flesh thick and dry, closely united with the brown, rough nut; seed completely filling the cavity, compressed, rounded at each end, thick-edged and marked by a conspicuous black spot.

Corkwood is soft, close-grained, pale yellow, without heart-wood; its specific gravity is about 0.21. It is the lightest wood in our area except the Papaya, and is used locally for the floats of fishing nets.

The name is in honor of Dr. Edward F. Leitner, a German physician and naturalist, who was lost in Florida during the Seminole war of 1838.

WALNUT FAMILY

JUGLANDACEÆ Lindley



ABOUT 6 genera compose this family, including some 35 species of trees or shrubs mostly of the warmer portions of the north temperate zone; they are of much economic importance, as the fruit of the majority of them contains a large nutritious, oily seed used for food and from which a fixed oil is also expressed and used as food and for mechanical purposes. The bark and husks of some of the walnuts are used as dyestuffs and in medicine as astringents and cathartics; their wood is much esteemed for cabinet work. The fruits of the hickories are also much used for food and their wood is valued on account of its strength and flexibility. Many fossils referable to this family have been found in North America, over 30 species of fossil *Juglans* and about 10 of *Hicoria* having been described.

The Juglandaceæ have alternate, pinnately compound leaves, without stipules. The flowers are monœcious; the staminate are borne in lateral, long drooping catkins and consist of an irregular, 2- to 6-lobed perianth, which is sometimes united to a bract or may be entirely wanting; stamens 3 to many in several series, inserted upon the perianth, if present; their filaments are distinct; anthers erect, 2-celled, opening lengthwise; rarely a rudimentary ovary is present. The pistillate flowers are terminal, solitary or in clusters, and consist of an incompletely 2- to 4-celled ovary, subtended by an involucre of more or less united bracts and 2 lateral bractlets; style terminal, short; stigmas 2, long, stigmatic on the inner side or sometimes plumose; ovules solitary. Fruit in the North American genera drupe-like, the dry, hard, or fibrous husk dehiscent or indehiscent, enclosing a crustaceous or bony, smooth, or sculptured nut; the seed is large, oily, 2- to 4-lobed with a papery coat; endosperm none; embryo large; cotyledons fleshy and wrinkled.

Husk indehiscent; nut sculptured; staminate catkins solitary, thick, sessile or but short-stalked.

1. *Juglans*.

Husk splitting into several segments; nut not sculptured; staminate catkins in 3's, slender, long-stalked.

2. *Hicoria*.

I. THE WALNUTS

GENUS **JUGLANS** [TOURNEFORT] LINNÆUS

HIS genus consists of about 10 species of trees of the north temperate zone, about 3 in the Andean region and 2 in the West Indies. They are of considerable economic value; the aromatic bark of some is medicinal, the husks and bark are also astringent and some are used as dyes and tans. The wood is probably the most highly priced of American timbers, being in great demand for furniture and gunstocks. The fruit is very rich in oil, which is largely expressed and used for food and in painting; for this purpose the fruit of the European walnut, *Juglans regia*, is the best on account of its sweetness and delicate flavor; it is largely cultivated in several improved forms in all the warmer countries of Europe, in our southern States, and especially in California.

They have deciduous, alternate, odd-pinnate compound leaves, with sessile or but slightly stalked leaflets; the pith of the twigs is in plates separated by large air-cells. The flowers are very small, the staminate in drooping cylindric catkins, solitary on the twigs of the previous season; the perianth is 3- to 6-lobed; stamens 8 to 40, in 2 series or more, their anthers smooth, 2-celled and terminated by a large broad connective. The pistillate flowers are solitary or in spike-like clusters at the end of the new growth; their perianth is 4-lobed and adnate to the incompletely 2- to 4-celled ovary; style very short or absent; stigmas spreading and plumose. The fruit, which ripens the first season, is globose or oblong-cylindric, sometimes obscurely angled; its husk is fibrous, sometimes somewhat fleshy, indehiscent; the nut is deeply sculptured or grooved, thick-walled, imperfectly 2- to 4-celled and separates ultimately into 2 valves; seed large, oily, and 2-lobed.

The name is a contraction of the Latin *Jovis glans*, the nut of Jupiter, the type being the European *J. regia* Linnæus.

Our species are:

Fruits usually racemed, viscid; nut 4-ribbed.

1. *J. cinerea*.

Fruits usually 1 to 3 together; nut not 4-ribbed.

Nut irregularly ridged, 3 to 4.5 cm. in diameter; eastern tree.

2. *J. nigra*.

Nut grooved, not irregularly ridged, western trees.

Nut less than 2 cm. in diameter, plainly grooved; Texas

3. *J. rupestris*

Nut 2 to 3 cm. in diameter

Nut very inconspicuously grooved; California

4. *J. californica*.

Nut distinctly grooved; New Mexico and Arizona.

5. *J. major*.

1. BUTTERNUT — *Juglans cinerea* Linnæus.

A common tree in rich alluvial soils near the banks of streams and on wooded hillsides from New Brunswick to Ontario, and North Dakota, southward to Delaware, in the mountains to Georgia and Alabama, and to Arkansas. It

attains a maximum height of 30 meters, with a trunk diameter of 1 m. It is also known as White walnut and Walnut.

The trunk is usually divided at or below the middle into outspreading branches, forming a broad round-topped tree. The bark is 18 to 25 mm. thick, deeply furrowed into flat ridges, which are divided into close plates of a brown color; that of younger stems is smooth and grayish. The twigs are stout, pithy, rusty brown-hairy, gradually becoming smooth, green or yellowish brown, somewhat shining and marked by large leaf-scars. The terminal winter buds are 12 to 18 mm. long, obliquely flattened above, blunt, and covered by hairy scales; the lateral buds are much smaller. The leaves are 3 to 6 dm. long, including the hairy leaf-stalk. There are 11 to 17 leaflets; these are short-stalked, lanceolate to oblong, 6 to 12 cm. long, the central pairs somewhat the longest, sharp or taper-pointed, unequally rounded at the base, sharply toothed on the margin; the terminal leaflet is often long-stalked; they are thin, yellowish green, and wrinkled, viscid-hairy at first but becoming quite smooth above, paler and softly hairy, with prominent lighter colored venation beneath. The flowers appear when the leaves are partly grown, the staminate in cylindric catkins 6 to 15 cm. long, their bracts brownish hairy on the outer surface; perianth 6 mm. long, mostly 5-lobed; stamens 8 to 12, their anthers dark brown. The pistillate flowers are several together in spicate clusters, narrowed beneath the calyx, about 8 mm. long; stigmas 12 mm. long, slender, bright red. The fruits ripen several together; they are oblong-cylindric, 8 to 12 cm. long, 2- or 4-ridged, pointed at the apex, rounded at the base, very viscid, with rusty brown hairs. The husk is thin and dryish; nut ovoid-oblong, abruptly taper-pointed, rounded at the base, broadly 2-ridged, with two less prominent ridges between, longitudinally deeply and irregularly sculptured, light brown, 2-celled at the base, 1-celled above, the cavity extending into the tapering apex; its wall is hard, about 6 mm. thick, with internal cavities; seed sweet, edible; cotyledons oblong, sharply ridged on the outer side, somewhat grooved on the inner.

The wood is soft, weak, rather close-grained, and light brown; its specific gravity is about 0.41. It is much used for furniture and in cabinet-work. The inner bark, which is white, becoming yellow and finally brown on drying, is cathartic and much employed by some physicians. The sap produces a good sugar. The fresh bark and husks yield a yellow dye. The nut is largely used in some sections while fresh but becomes rancid quickly.

It is a handsome shade tree and would be a great favorite if it leaved out earlier and retained its foliage longer in the autumn.



FIG. 176. — Butternut.

2. THE BLACK WALNUT — *Juglans nigra* Linnæus

This grand tree occurs in rich soil, particularly in the bottom lands of river valleys from western Massachusetts to southern Ontario and Minnesota, southward to Georgia, Florida, Mississippi, and Texas, reaching a maximum height of 50 meters, with a trunk diameter of 2.5 m. It is also called Walnut tree and Walnut.

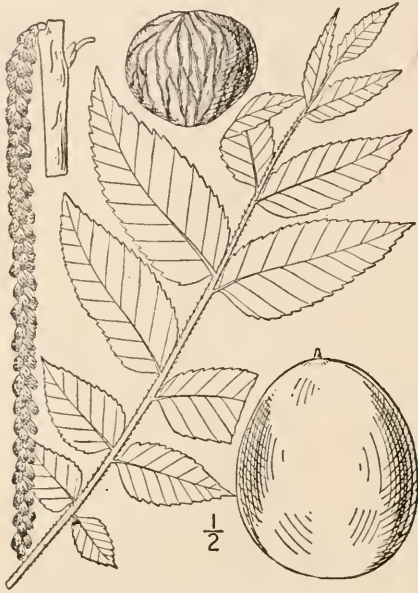


FIG. 177. — Black Walnut.

The trunk is tall and straight. The branches are stout and ascending or spreading, forming a round-topped tree. The bark is 5 to 7 cm. thick, deeply furrowed into narrow blunt ridges, which split into thick, close scales of a dark brown color; that of younger stems is smooth, somewhat scaly, brown outside, dark gray underneath the scales. The twigs are stout, pithy, densely covered with brownish hairs, gradually becoming nearly smooth, dull light brown, and marked by conspicuous yellowish lenticels and large angular leaf scars. The terminal buds are ovoid, slightly flattened, 8 mm. long, obliquely rounded at the apex, and covered by ovate hairy scales. The axillary buds are small and blunt. The leaves are 3 to 6 dm. long, including the stout, hairy leaf-stalk. There are 13 to 23 leaflets; the terminal leaflet is often wanting. The leaflets are ovate or ovate-lanceolate, sharply or taper pointed, rounded or somewhat heart-shaped at the unequal base, sharply small-toothed on the margin, sessile or nearly so, thin, bright-green, smooth and faintly shining above, paler and softly hairy beneath. The staminate catkins are 5 to 10 cm. long, their bracts somewhat triangular, usually brown-hairy; perianth rounded, 6-lobed, the lobes irregularly orbicular, concave, hairy on the outer surface; stamens 20 to 30 in several series; anthers nearly sessile, purplish. The pistillate flowers are in 2-to 5-flowered spikes, ovoid, 6 mm. long, gradually narrowed upward; stigmas spreading, 12 to 18 mm. long, yellowish green tinged with red. The fruit is solitary or rarely in pairs, globular to oblong or somewhat pear-shaped, 5 to 8 cm. in diameter, rounded at both ends, yellowish green and roughish, with a rather thick husk; the nut is globose to ovoid, slightly flattened, sometimes broader than long, 2-celled above, 4-celled below the middle, the surface sculptured into thick, irregular ridges, dark brown; the wall is hard, about 5 mm. thick with irregular cavities; the seed is light brown, grooved and concave on the back, deeply lobed at each end.

The wood is hard, strong, rather coarse-grained, dark brown and satiny;

its specific gravity is about 0.61. It is very durable, easily worked, takes a fine polish, and is a very beautiful wood, suitable for furniture, cabinet and inside work, and gunstocks, and is the most valuable wood of the North American forests. The nuts are used for food to a considerable extent.



FIG. 178. — Black Walnut, New Dorp, N. Y.

A handsome tree for shade or ornament, often planted, but disappointing on account of the short duration of its foliage. It is now planted for lumber.

Trees intermediate between the Butternut and the Black walnut, with elongated fruit, possibly natural hybrids, occur in the Delaware valley, and trees apparently crosses of the Black walnut with the European walnut occur in various places in the eastern States.

3. TEXAN WALNUT — *Juglans rupestris* Engelm.

An inhabitant of the limestone regions of western Texas, where it occurs as a tree with a maximum height of 9 meters, but is often only a large shrub.

Its branches are mostly upright, forming a stiff, narrow tree. The bark is about 8 mm. thick, furrowed and broken into close plates; on young stems it is quite smooth and yellowish white. The twigs are slender, brown, finely densely hairy, becoming smooth, nearly white, and marked with small triangular leaf scars. The terminal winter buds are about 8 mm. long, very hairy. The leaves

are 1.5 to 4 dm. long, including the slender pale hairy leaf-stalk, composed of 13 to 23 usually short-stalked leaflets; these are lanceolate, curved, tapering to an elongated apex, oblique, rounded or tapering at the base, sharply toothed on the



FIG. 179. — Texan Walnut.

margin, the central pairs about one third longer than the others; they are reddish tinged and hairy when unfolding, becoming yellowish green and smooth above, sometimes hairy beneath, especially along the stout midrib. The staminate catkins are rather slender, nearly smooth, 5 to 10 cm. long, their bracts ovate-lanceolate, sharp-pointed, nearly smooth; perianth 3- to 5-lobed, nearly orbicular, light yellow-green, smooth or nearly so, short-stalked; stamens about 20, nearly sessile, their anthers dark. Pistillate inflorescence a terminal spike, the flowers narrowed at base and apex, finely hairy, about 3 mm. long; stigmas 8 mm. long, spreading, tinged with red. The fruit is globose, about 18 mm. in diameter, its

husk finely hairy; nut globose, usually flattened at the base, dark brown, ridged with deep, seldom forking grooves, 4-celled at the base, 2-celled above, its walls very thick and compact; seeds small and sweet.

The wood is hard, weak, close-grained, dark brown; its specific gravity is about 0.70. It is not of economic importance.

This interesting little walnut has been grown in parks and gardens, and is hardy as far north as Massachusetts.

4. CALIFORNIA WALNUT — *Juglans californica* S. Watson

This walnut occurs along river valleys and stream banks in western California, extending from Los Angeles county northward to Napa county. It is a very beautiful tree, attaining a height of 18 meters, with a trunk diameter of 0.5 meter; sometimes, however, it is reduced to a shrub.

The branches are stout, spreading, and often somewhat drooping, usually forming a round-topped tree. The bark is 8 to 12 mm. thick, deeply fissured into long, rough, wide ridges and broken into close, dark brown to black scales; that of the branches is smoother and nearly white. The twigs are rather stout, and densely hairy when young, soon becoming nearly smooth, reddish, and finally paler or nearly white; the rounded-triangular leaf scars are quite prominent. The leaves are 1.5 to 2.5 dm. long, including the slender, slightly hairy leaf-stalk, composed of 9 to 17 leaflets; these are oblong-lanceolate, more or less oblique and

curved, sessile, the middle pairs slightly longest, blunt or sharp-pointed, rounded or slightly heart-shaped at the base, or the terminal leaflet usually tapering at the base, sharply saw-toothed on the margin, brownish green and scurfy when unfolding, becoming membranous, light green and smooth above, paler and somewhat hairy at the junction of the principal veins beneath. The staminate flowers, opening from March to May, are in slender loose hairy catkins 5 to 7 cm. long; the bracts are brownish hairy on the outer surface; the perianth, also hairy, is 5- or 6-lobed; stamens 30 to 40; anthers short, yellow, the connective, prominently notched. The pistillate flowers are terminal, spicate, few together, ovoid, about 3 mm. long; the stigmas are recurved, 12 mm. long and yellow. The fruit is globose, 2 to 3.5 cm. in diameter with thin, brown husk, finely hairy on the surface. The nut is almost globular, without ridges, slightly compressed, usually flattened at the base; the walls are thin, light brown, with few shallow grooves; kernel sweet and remaining so for some time before becoming rancid.



FIG. 180. — California Walnut.

The wood is hard, rather coarse-grained, dark brown, sometimes beautifully mottled; its specific gravity is about 0.63; it is used for fine cabinet work. The tree is often planted in the Pacific States for shade and as a stock upon which to graft the finer varieties of the European walnut; a hybrid with the latter has also been obtained by cross-pollination.

5. ARIZONA WALNUT — *Juglans major* (Torrey) Heller

Juglans rupestris major Torrey

This tree is larger in all its parts than the Texan walnut and grows further westward in New Mexico and Arizona, also in adjacent Mexico, occurring in cañons and on the mountains south as far as Durango. It attains a maximum height of 15 meters, with a trunk diameter of 1.5 m.

The trunk is rather short, soon dividing into stout, outspreading or pendulous branches. The bark is about 2 cm. thick, deeply furrowed into ridges which break into irregular, close, thin scales of a dark grayish color; that of younger stems is smoother, gray to nearly white. The twigs are stout and pithy, covered with brownish hairs, becoming nearly smooth, white, and bearing large triangular

leaf scars. The leaves are up to 4 dm. long, including the stout, brownish hairy leaf-stalk, consisting of 9 to 19 short-stalked, lanceolate or ovate-lanceolate leaflets, 6 to 12 cm. long, or the lower ovate, broadest near the rounded base, long taper-pointed, and coarsely toothed on the margin, yellowish hairy when unfolding, becoming yellowish green and smooth, or hairy along the prominent, stout, yellow midrib beneath. The staminate catkins are slender, somewhat hairy, 5 to 10 cm. long, the bracts ovate-lanceolate, sharp-pointed, and yellowish woolly,



FIG. 181. — Arizona Walnut.

the perianth nearly orbicular, 3- to 5-lobed, short-stalked, nearly smooth; stamens about 20, their anthers yellow, nearly sessile, with slightly lobed connectives. The pistillate flowers are 3 to 6 mm. long, coated with brown woolly hairs; the bracts of the involucre are irregularly toothed, rather shorter than the sepals. The fruit is globose, rarely oblong, about 4 cm. in diameter, its husk brownish hairy; nut globose, without ridges, sometimes slightly compressed, longitudinally grooved, with shallow grooves, 4-celled at the base, 2-celled at the apex, brown to nearly black, the wall thin and containing many cavities; seed large and sweet.

The wood is hard, rather weak, coarse-grained, rich dark brown, and satiny; its specific gravity is about 0.67.

This tree is distinguished from the Texan walnut by its larger, broader, and more coarsely toothed leaves, larger fruit, with a thinner walled, less grooved nut.

The recently described *Juglans elaeopyren* Dode, from the Santa Catalina Mountains, Arizona, differs from this species by its longer, sharp-pointed nuts, but considering the known variability in shape of the nuts of other walnuts and hickories, it cannot be certainly held to be distinct, at least until more is known of it.

II. THE HICKORIES

GENUS **HICORIA** RAFINESQUE

Carya Nuttall



HICKORIES are confined to eastern North America where 14 species are known, and one inhabits Mexico. Many fossil species have been described from Europe, Greenland, and western North America.

They have an aromatic watery sap, solid pith, and very tough wood, which is highly valued on account of its strength, elasticity, and lightness, being largely used for ax and other handles, the spokes of buggy and wagon wheels, and is one of the very best woods for fuel and for the curing of meat. The nuts

of some have a sweet, oily kernel, which was of great importance to the North American Indians who used it for food and for oil; they are of increasing importance as food at the present time.

The Hickories have alternate, deciduous, odd-pinnate leaves, the leaflets usually membranous. The flowers are monœcious, the staminate in slender, drooping catkins borne in clusters, usually of 3, near the base of the young shoot of the season after the leaves have unfolded; their perianth is 3-lobed or sometimes 2-lobed, subtended by an almost free bract, which is longer than the lobes of the perianth; stamens 3 to 10 in several series; filaments short; anthers 2-celled and hairy, each notched at the tip, the sacs opening lengthwise, the connective inconspicuous. The pistillate flowers are in spike-like clusters of 2 to 6 at the end of the season's twigs, their 1-lobed perianth adnate to the ovary. The ovary is inferior, 1-celled; stigmas 2, sessile, spreading. The fruit ripens the first season, is globose, ovoid, or cylindric; the husk becomes dry, hard, and woody, 4-valved, splitting, in most species, to at least the middle, its angles sometimes winged; nut thick-walled, smooth, mostly compressed, usually 2-celled above, and 4-celled below the middle; seed sweet or bitter, without endosperm, 2-lobed, the lobes variously grooved, its coat thin and papery, of two layers, the outer brown.

The generic name is adapted from the North American Indian name, and is ten years older than *Carya* Nuttall. *Juglans alba* Linnæus is the type species.

Cotyledons of the seed entire, or merely notched at the apex; nuts

round or slightly flattened; bud-scales valvate.

Leaflets 5-9; shell of the nut very thick.

1. *H. myristicæformis*.

Leaflets 9-15; nuts with very thin shells.

Nut round; seed sweet.

2. *H. Pecan*.

Nut somewhat flattened; seed bitter.

3. *H. texana*.

Cotyledons deeply 2-lobed; nuts compressed.

Bud-scales valvate; lateral leaflets usually curved.

Leaflets 9-13, glabrous; nuts corrugated.

4. *H. aquatica*.

Leaflets 5-9, pubescent beneath; nuts smooth.

5. *H. cordiformis*.

Bud-scales imbricated; lateral leaflets not curved.

Bract much longer than the lateral lobes of the staminate calyx;

husk of the fruit freely splitting to the base.

Bark close, rough; foliage scurfy or pubescent.

Rachis of the leaves and the staminate aments scurfy, at least when young.

6. *H. pallida*.

Rachis and staminate aments densely hirsute.

7. *H. alba*.

Bark shaggy, separating in plates; foliage glabrous or pubescent.

Leaflets 7-9; nuts pointed at both ends.

8. *H. laciniosa*.

Leaflets 3-5; nuts usually rounded or notched at the base.

Leaflets oval to oblong-lanceolate, puberulent.

9. *H. ovata*.

Leaflets lanceolate, glabrous or glaucous beneath.

10. *H. carolinæ-septentrionalis*.

Bract about as long as the lateral lobes of the staminate calyx (except in *H. borealis* and sometimes in *H. glabra*); husk of fruit not freely splitting to base.

Bark shaggy, at least when old; fruit subglobose to oblong.

Fruit little flattened; bract of staminate calyx short.

Fruit much flattened; bract of staminate calyx long.

Bark close, not shaggy; fruit more or less obovoid.

Foliage glabrous or little pubescent; bract of staminate calyx sometimes elongated; anther-sacs acute.

Foliage pubescent or scurfy; bract of staminate calyx short, blunt; anther-sacs obtuse.

11. *H. microcarpa*.

12. *H. borealis*.

13. *H. glabra*. ✓

14. *H. villosa*.

I. NUTMEG HICKORY — *Hicoria myristicæformis* (F. A. Michaux) Britton

Juglans myristicæformis F. A. Michaux. *Carya myristicæformis* Nuttall

This Hickory grows in rich soil on the borders of streams and swamps, occurring from South Carolina to Alabama, Mississippi, Arkansas and Texas, and adjacent Mexico. Its maximum height is 35 meters, with a trunk diameter of 1 m.; it is called Bitter walnut in Louisiana.

The trunk is tall and straight, the branches mostly stout, somewhat spreading.

The bark is 12 to 18 mm. thick, shallowly fissured into irregular, close, dark reddish brown scales. The twigs are slender, covered with brownish or yellowish scales, hairy, soon becoming smooth, light brown or gray and finally dark brown, with triangular leaf scars. The terminal bud is broadly ovoid, 3 to 6 mm. long, rather blunt, covered by scurfy, thick scales; the axillary buds are much smaller and pointed. The leaves are 1 to 3 dm. long, with slender, slightly grooved scurfy leaf-stalks. The leaflets, 5 to 9 in number, are thin, firm, short-stalked, or nearly sessile, obovate to ovate-lanceolate, 5 to 12 cm. long, slightly curved, unequally tapering or somewhat rounded at the base, sharp or taper-pointed, rather coarsely toothed



FIG. 182. — Nutmeg Hickory.

on the margin; the terminal leaflet is symmetrical and tapers into a winged stalk; they are dull green and shining on the upper surface, paler and with more or less hairy and scurfy midribs beneath. The staminate catkins are 6 to 10 cm. long on a short peduncle; the bracts of the flowers are ovate, sharp-pointed, twice as long as the ovate rounded lobes of the perianth; stamens 6; anthers oblong, notched at the top. The pistillate flowers are oblong, scurfy hairy. The fruit is nearly cylindric or elliptic-obovoid, 2.5 to 3.5 cm. long, prominently 4-ridged;

husk very thin, about 1 mm. thick, yellowish scurfy, splitting to near the base into 4 valves; nut pointed at each end, smooth, scarcely if at all grooved, brown; the shell is very dark, 3 mm. thick or more, 2-celled at the base by a very thick partition; seed small and sweet, the cotyledons nearly entire.

The wood is hard, tough, and very strong, close-grained, light brown; its specific gravity is about 0.80. It is used for fuel and for other purposes in which hickory is desirable.

The leaves of this tree are the most lustrous of the Hickories. It should be a most desirable tree for parks and lawns in the southern States, in which, however, it is very seldom seen at the present time.

2. PECAN — *Hicoria Pecan* (Marshall) Britton

Juglans Pecan Marshall. *Carya oliviformis* Nuttall. *Carya Pecan* C. K. Schneider

A very handsome tree, the largest of Hickories, native of rich, moist soils of river valleys from Indiana to Iowa, Missouri and Kansas south to Alabama and Texas, attaining in its greatest development in Texas a height of about 50 meters, with a trunk diameter of 2 m.

The trunk is large, straight and tall. The branches are stout, short and little spreading, in the forest forming an oblong or inverted cone-shaped head; in the open the lower branches are spreading, the tree becoming round-topped. The bark is 2.5 to 4 cm. thick, deeply but narrowly furrowed into irregular, rough, angular, light reddish brown ridges. The twigs are stout, pale and loosely hairy, soon becoming smooth, reddish brown, and bearing large oblong 3-lobed leaf scars. The terminal winter buds are about 12 mm. long, sharp-pointed, covered by narrow, hairy scales, which do not increase very much in size as the bud expands; the lateral buds are small, yellowish hairy, two together, borne one above the other, the upper one the larger. The leaves are 3 to 5 dm. long, including the slender, flattish, slightly grooved, more or less hairy leaf-stalk. Leaf-



FIG. 183. — Pecan.

lets 9 to 15, the smaller near the base, thin but firm in texture, on short, stout stalks; they are ovate to oblong-lanceolate, 8 to 15 cm. long, somewhat curved, unequally rounded or wedge-shaped at the base, long taper-pointed at the apex, coarsely toothed; the terminal leaflet is equally wedge-shaped at the base and often stalked; they are dark green, smooth or nearly so above, pale and prominently yellowish veined beneath. The staminate catkins are 12 to 15 cm. long, slightly hairy, sessile or nearly so, near the ends of the twigs of the previous season; the perianth is light green, hairy, the lateral lobes are broadly ovate, sharp-pointed,

the bract narrower; stamens 6, their anthers nearly sessile and yellow. The pistillate flowers are oblong, somewhat 4-angled, yellowish scurfy. The fruit is clustered, oblong to oblong-cylindric, 3.5 to 6 cm. long, 4-angled, the husk thin, about 1.5 mm. thick, 4-valved, dark brown, yellowish hairy, splitting nearly to the base when ripe; the nut is ovoid to cylindric, round or but slightly angular, sharp-pointed, rounded at the base, often stalked, red-brown, thin-shelled, 2-celled by the thin astringent partition at the base; seed deliciously sweet, grooved, reddish brown.

The wood is hard, rather brittle, rather weak, close-grained, light reddish brown; its specific gravity is about 0.72. It is the least valued of hickory woods, but like all of them is very desirable for fuel.

The tree is hardy as far north as Philadelphia. It is frequently planted in the south for ornament or shade, for which it is very desirable; also for its fruit. It is cultivated in a variety of forms, selected for the size of the nut, sweetness of its kernel, and thinness of the shell. The fruit is collected in large quantities and sold in all the markets of the north.

Natural hybrids of this with *Hicoria cordiformis*, *H. alba* and *H. laciniosa* have been reported from several stations.

3. TEXAN PECAN — *Hicoria texana* (Le Conte) Britton

Hickorea texana Le Conte. *Carya texana* C. de Candolle

This is a tree of low grounds and river swamps, closely related to the ordinary



FIG. 184. — Texan Pecan.

Pecan, known only from Texas, where it reaches a maximum height of about 30 meters with a trunk diameter of 9 dm. though usually much smaller and sometimes bushy.

The branches are somewhat spreading, forming a rounded tree. The bark is 12 to 18 mm. thick, irregularly fissured into close plates of a reddish brown color. The twigs are slender, pale hairy, becoming smooth, light brown and finally grayish brown. The terminal buds are oblong, sharply or taper-pointed, slightly compressed, 6 mm. long, and yellowish hairy; the lateral buds are much smaller, borne one above the other. The leaves are 2 to 4 dm. long, the leaf-stalk slender, 2.5 to 4 cm. long, slightly flattened and grooved, thickly hairy at first, less hairy when old.

Leaflets 7 to 13, lanceolate to oblong-lanceolate, 8 to 15 cm. long, curved, unequally rounded at the nearly sessile base, taper-pointed, shallowly sharp-toothed on the margin, the terminal leaflet symmetrical, gradually tapering to its stalk; they are hairy at first, becoming thin and firm, dark green and nearly smooth above, pale yellowish green and minutely hairy beneath. The staminate catkins are slender, 5 to 11 cm. long, nearly sessile, yellowish and hairy; the lobes of the perianth are ovate, sharp-pointed; stamens 6, their anthers notched and hairy. The pistillate flowers are oblong, somewhat 4-angled and hairy. The fruit is in small clusters, oblong or oblong-ovoid, 3.5 to 5 cm. long, compressed, pointed at each end, dark brown, somewhat hairy; its husk is slightly 4-winged at the base, splitting into 4 valves. The nut is oblong-ovoid, a little flattened, pointed at each end, light red-brown, wrinkled, its shell thin, seed bitter and astringent, flattened, grooved and bright brown.

The wood is tough and strong, close-grained, light brown. The seed is bitter and inedible, so much so, it is said, that even hogs will not eat it. It is also called Thickbark hickory. The foliage of this tree is scarcely to be distinguished from that of the Pecan.

4. WATER HICKORY — *Hicoria aquatica* (F. A. Michaux) Britton

Juglans aquatica F. A. Michaux. *Carya aquatica* Nuttall

A species of river swamps and very wet woods from Virginia to Illinois southward to Florida and Texas, attaining in its greatest development in the lower Mississippi valley, a height of 30 meters with a trunk diameter of nearly 1 meter. It is also called the Bitter pecan, Swamp hickory, and Water bitternut.

The branches are mostly upright, forming a narrow tree. The bark is about 18 mm. thick, splitting into long, loose flakes of a light reddish brown color. The twigs are slender, somewhat glandular and hairy, soon becoming smooth or nearly so, reddish brown and finally dark gray, bearing pale lenticels and small leaf scars. The terminal bud is 3 to 6 mm. long, the scales valvate, covered with pale scattered hairs, or smooth with age; the lateral buds are about half as large. The leaves, are 2 to 3 dm. long, with from 7 to 13



FIG. 185. — Water Hickory.

leaflets, the leaf-stalk slender, rounded, dark red and slightly hairy; the leaflets are 7 to 13 cm. long, the lowest little if any shorter than the upper pairs; they are lanceolate, nearly symmetrical, tapering at the usually sessile base, long-pointed at the apex, coarsely toothed on the margin, pale and whitish hairy when unfolding, thin and membranous, dark green and rather shining above, brownish, some-

what shining, and hairy along the veins beneath. The staminate catkins are in clusters of 3, stout-stalked, hairy, 7 to 10 cm. long, the bracts linear, about as long as the lobes of the perianth; stamens 6, their anthers oblong, slightly notched, light yellow. The pistillate flowers are oblong, 4-angled, glandular and hairy. The fruit is clustered, oblong, 2 to 3.5 cm. long, compressed, dark brown, its husk very thin, tardily 4-valved to about the middle; nut oblong, flattened, 4-angled, pointed and corrugated, reddish brown, the wall and partition thin; the seed is oblong, 2-lobed above the middle, irregularly grooved and very bitter.

The wood is strong, rather soft and brittle, close-grained, dark brown; its specific gravity is about 0.74. It is little used except for fuel.

The Water hickory has not been successfully cultivated for ornament.

5. BITTER NUT — *Hicoria cordiformis* (Wangenheim) Britton

Juglans alba minima Marshall. *Juglans cordiformis* Wangenheim. *Carya amara* Nuttall. *Hicoria minima* Britton. *Carya cordiformis* K. Koch

The Bitter nut occurs in swamps and on hillsides from Quebec to Minnesota southward to Florida and Texas, attaining a maximum height of 30 meters, with a trunk diameter of 1 m. It is also called Bitternut hickory, Bitter pignut, Bitter hickory, Bitter walnut, Pig walnut, and White hickory.

The trunk is slender, tall and straight, its branches rather stout and sometimes widely spreading. The bark is 8 to 18 mm. thick, shallowly fissured into



FIG. 186. — Bitter Nut.

flat ridges of a light reddish brown color. The twigs are slender, bright green and somewhat hairy, soon becoming smooth or nearly so, reddish or yellowish brown and shining, finally gray and bearing many pale lenticels and leaf scars; the terminal buds are ovoid, 8 to 15 mm. long, flattened, obliquely blunt-pointed and protected by 4 valvate, yellowish, hairy, glandular scales; the lateral buds are much smaller and compressed, somewhat angular, sessile or stalked. The leaves are 1.5 to 3 dm. long, the leaf-stalk slender, slightly grooved, and hairy; the leaflets, the smallest of which are at the base, are 5 to 9 in number, lanceolate or oblong-lanceolate, slightly curved but quite equal at the rounded or tapering sessile base, long taper-pointed, and margined with

coarse, thick-pointed teeth; the terminal leaflet is sometimes stalked; they are yellowish green or reddish and glandular when unfolding, becoming thin but firm, yellowish green and smooth above, pale hairy and often glandular with prominent venation beneath. The staminate catkins are in stalked clusters of 3; they are

7.5 to 10 cm. long; bract ovate, pointed, twice the length of the lobes of the perianth, which are almost equal; stamens 4, their anthers ovate, deeply notched at the top and yellow. The pistillate flowers are blunt, 4-angled, about 12 mm. long, curved, scurfy hairy. The fruit is subglobose, 2 to 3.5 cm. long, narrowly 4-winged for about half its length, with yellowish and scurfy hairs; its husk is about 3 mm. thick, tardily and irregularly 4-valved; nut ovoid or oblong, slightly flattened, short-pointed, smooth, grayish, the shell thin; seed very bitter, deeply 2-lobed, reddish brown.

The wood is hard, close-grained, strong and tough, dark brown; its specific gravity is about 0.75. It is largely used for fuel, hoops, tool handles and other purposes.

This is a handsome tree and probably the most rapid growing of the hickories, holding its foliage long after that of the others has fallen, and deserves wider use in ornamental planting.

6. PALE HICKORY — *Hicoria pallida* Ashe

Hicoria villosa pallida Ashe

This tree occurs in dry soils from southern Virginia and Tennessee south to Florida and Alabama, reaching a height of about 30 meters, with a trunk diameter of 1 m.

The trunk and its branches resemble the Pignut. The bark is deeply furrowed into rough ridges of a gray color. The twigs are purple-brown. The terminal bud is ovoid, 5 to 7 mm. long, dark brown and hairy with 5 to 9 scales, the lateral buds being very small. The leaves are scurfy hairy, 1.5 to 2.5 dm. long, the leaf-stalk slender, hairy, at least when young. Leaflets 7 to 9, lanceolate or ovate-lanceolate, slightly curved, 5 to 15 cm. long, the lower pair much the smallest, long taper-pointed at the apex, rounded and unequal at the sessile base, closely toothed on the margin; the terminal leaflet is about



FIG. 187. — Pale Hickory.

the same size as the upper pair, tapering to a short, slightly winged stalk; they are silvery scaly beneath, becoming firm, smooth or nearly so when mature, dark green above, paler, often yellowish with prominent yellow veins beneath. The staminate catkins are in stalked clusters of 3, 8 to 20 cm. long and slender, the bract of the perianth linear, considerably longer than the rounded lateral lobes.

The pistillate flowers are densely brown-hairy. The fruit is subglobose or obovoid to pear-shaped, rusty brown and slightly winged, the husk rather thin, splitting rather tardily into 4 valves; nut white or nearly so, laterally flattened, 4-celled at the base, its shell moderately thin; seed sweet and edible.

The species has been confused with *Hicoria villosa*, which it much resembles.

7. MOCKER NUT — *Hicoria alba* (Linnæus) Britton

Juglans alba Linnæus. *Juglans tomentosa* Poirét. *Carya tomentosa* Nuttall

This handsome forest tree occurs in rich woods from Massachusetts and Ontario to Nebraska, southward to Florida and Texas, having its greatest development in numbers and size in the central states. Its maximum height is about 30 meters, with a trunk diameter of 1.5 m. It is also known as Mocker nut

hickory, Butternut, White heart hickory, Black hickory nut, Big bud, Red hickory, White hickory, Big hickory nut, Hognut, Common hickory, and Bull nut.



FIG. 188. — Mocker Nut.

The trunk is tall and straight in the forest, but in the open it is often widely branched or forked. The branches are stiff, upright, spreading, or often drooping, forming, when not crowded, a nearly cylindric tree. The bark is 12 to 20 mm. thick, irregularly furrowed into broad, close, flat, more or less scaly ridges of a dark or light gray color. The twigs are stout, somewhat angular and thickly covered with pale hairs, becoming round, nearly smooth, red-brown and finally dark gray, and bearing large lenticels and leaf scars. The terminal bud is ovoid, 12 to 25

mm. long, covered with imbricated scales, which are thick and coated with long whitish hairs; the inner scales grow to about 3.5 cm. long, are silky hairy, often red on the inner surface and fall off after the flowers appear. The leaves are very fragrant, 2 to 3 dm. long, their leaf-stalk hairy, flattened and grooved, enlarged at the base; the 5 to 9 leaflets are oblanceolate to oblong-lanceolate, 7 to 9 cm. long, the upper pair the largest and broadest above the middle, 8 to 20 cm. long; they are tapering or rounded at the nearly equal, sessile base, taper-pointed, coarsely or finely toothed on the margin; the terminal leaflet is broadest above the middle and tapers to its slightly winged stalk, which is 6 to 12 mm. long; they are light green, softly hairy when unfolding, becoming firm, dark yellow-green and somewhat shining above, pale, often yellowish or brownish, softly hairy along the stout, yellow midrib beneath. The staminate catkins are in stalked clusters of 3, loosely hairy, 10 to 15 cm. long; bract 3 or 4 times longer than the ovate, blunt lobes of the perianth; stamens 4, their anthers nearly sessile, oblong, notched,

light red and hairy. The pistillate flowers are clustered 2 to 5 together, somewhat constricted toward the top, pale hairy; their stigmas are dark red. The fruit is globose or globose-obovoid, 4 to 9 cm. long, dark reddish hairy or nearly smooth; husk thick, readily splitting to near the base; the nut smooth, slightly flattened, 4-angled, pointed at the top, rounded at the base and reddish brown, the shell and partitions thick and hard; seed sweet, relatively small, deeply lobed, brown and shining.

The wood is very hard, strong, tough and elastic, close-grained, and dark brown; its specific gravity is about 0.82. It is used as is the wood of other species, all of which are indiscriminately called hickory in the lumber trade.

A handsome tree, which retains its foliage longer in the autumn than most other hickories.

8. BIG SHELLBARK — *Hicoria laciniosa* (F. A. Michaux) Sargent

Juglans laciniosa F. A. Michaux. *Carya sulcata* Nuttall, not *Juglans sulcata* Willdenow

This tree grows mainly in rich lands that are more or less subject to overflow along rivers from New York to Iowa and Nebraska, southward to Tennessee and Arkansas. It is rare near the Atlantic coast, but very plentiful in the central States. Its maximum height is about 40 meters, with a trunk diameter of 1.5 m. It is also known as the Big shagbark, Thick shellbark, Kingnut, and Gloucester broad nut.

The trunk is straight and rather slender. The branches are mostly short and spreading, forming a narrow cylindric tree. The bark is gray, 2.5 to 4 cm. thick, freely splitting into long and narrow plates, which hang on for many years; the bark of the branches is smoother and lighter. The twigs are stout, angular, hairy, becoming round, nearly smooth, and yellowish, by which feature it is easily distinguished from all other hickories. The terminal buds are ovoid, bluntish, often 2.5 cm. long and two thirds as thick, covered by many imbricated scales, the outer scales dark brown, long-pointed and slightly hairy; the inner scales are densely coated with yellow hairs; some of them continue to grow after the expansion of the bud, becoming 5 to 7 cm. long, obovate, reflexed, light green or red or yellow, smooth and shining on the inner surface, silky and somewhat resinous on the outer surface, and fall off with the staminate catkins. The leaves are 2.5 to 5.5 dm. long, the leaf-stalk stout, smooth or hairy, flattish, grooved, abruptly thickened at the base, often remaining on the branches long after the leaflets have fallen. The leaflets, usually 7 to 9, rarely but 5, are obovate, oblong or oblong-lanceolate, the upper broadest



FIG. 189. — Big Shellbark.

above the middle and considerably longer than the lowest, wedge-shaped or rounded at the nearly equal, sessile base, sharp or taper-pointed, finely toothed with thick-tipped teeth; the terminal leaflet is often about twice the size of the lower leaflets, broadest above, and gradually tapering to a stout stalk often 2.5 cm. long; they are hairy beneath when unfolding, becoming thick and firm, rather dark green and somewhat shining above, pale green or brownish and softly hairy beneath, especially along the prominent yellowish midrib and larger veins. The staminate catkins are in stalked clusters of 3, each 1.25 to 2 dm. long; the bracts smooth or nearly so, twice as long as the broad and rounded lobes of the perianth; anthers notched and hairy. The pistillate flowers are in spikes of 2 to 5, oblong-ovoid, slightly angled, densely hairy; stigma light green. The fruit is broadly oblong or oblong-obovoid, usually depressed at the top, 5 to 8 cm. long, smooth or downy, yellowish or brownish; its husk is hard, often 8 mm. thick, splitting readily to the base; the nut is broadly oblong, somewhat flattened, pointed at each end, yellowish white, 4-ridged and angular, its shell very thick and hard; seed sweet, deeply lobed, light brown and shining.

The wood is hard, tough and strong, close-grained, elastic and dark brown; its specific gravity is about 0.81. It is used in the manufacture of wheels, tool handles, and for the other purposes in which the wood of other hickories is used, not being distinguished from them commercially.

The fruit is also marketed as are Shellbark hickory nuts, especially in the cities of the West.

A supposed hybrid of this with the Pecan is reported from several stations at which both species are naturally associated.

9. SHELLBARK — *Hicoria ovata* (Miller) Britton

Juglans ovata Miller. *Carya alba* Nuttall, not *Juglans alba* Linnaeus

This well-known tree is an inhabitant of rich, moist soil mostly in valley or hillside woods from Quebec to Minnesota and Kansas, south to Florida and Texas, frequent in the interior, but not common along the coast south of New Jersey. Its maximum height is 40 meters, with a trunk diameter of 1.5 meters. It is also called Shellbark tree, Upland hickory, White hickory, Red heart hickory, Hickory, White walnut, Shagbark walnut, Sweet walnut, and Walnut.

The trunk is straight and slender, when crowded usually bearing branches only above; in the open the branches sometimes persist nearly to the ground, the shape of the perfect tree being oblong-cylindric or somewhat wider near the top than at the middle. The bark is 1 to 2.5 cm. thick, light gray and broken into thick, flat flakes often 3 dm. long, free at the ends but closely attached between them; that of younger stems is smooth and light gray. The twigs are stout, slightly angular, and covered with brown scurfy and glandular hairs, soon becoming round, smooth, and shining, or nearly smooth, reddish brown to light gray and bearing many broad leaf scars. The terminal bud is broadly ovoid, bluntish, 12 to



FIG. 190. — Shellbark, New York Botanical Garden.

18 mm. long; the scales are imbricated, and hairy, the outer broadly ovate, sharp-pointed, dark brown and hairy; the inner scales grow as the bud opens, becoming conspicuously enlarged, yellowish green or reddish, reflexed, 7 cm. long, usually persisting until the staminate catkins fall. The leaves are 2 to 3.5 dm. long, the leaf-stalk stout, slightly grooved, much thickened at the base, smooth or hairy. The 5 or rarely 7 leaflets are obovate to oblong-lanceolate, 10 to 15 cm. long, the lowest pair shorter and broader at the base, usually straight, equal at the tapering or rounded base, taper-pointed, margined with small, thick-tipped teeth; the terminal leaflet is broadest above the middle, tapering to a slightly winged slender stalk 4 to 10 mm. long; they are thin and firm, yellowish green



FIG. 191. — Shellbark.

and smooth above, smooth and shining or slightly hairy beneath. The staminate catkins are in stalked clusters of 3, slender, light green, glandular and hairy, 1 to 1.5 dm. long, the flowers opening when the leaves are nearly completely unfolded, their linear-lanceolate bracts elongated and much longer than the lobes of the perianth, which are ovate; stamens 4, nearly sessile, their anthers slightly spreading, lobed at the apex, yellow and somewhat hairy; the pistillate flowers are in spikes of 2 to 5, rusty-woolly; stigma pale green. The fruit ripens in September and October, usually in pairs or solitary, subglobose, 3 to 5 cm. long, depressed, the top bearing the withered remnants of the stigma, dark reddish brown, smooth or slightly hairy; husk variable

ble, often 8 mm. thick, 4-valved, splitting to the base; nut oblong, subglobose or obovoid, very variable in size and shape, somewhat flattened, pointed and slightly wrinkled and angular, white, the shell and partitions relatively thin; seed sweet, deeply 2-lobed, irregularly ridged, light brown, somewhat shining.

The wood is hard, strong, tough and elastic, close-grained and light brown; its specific gravity is about 0.84. It is largely used in the manufacture of vehicles, agricultural implements, ax handles, baskets and hoops, and for fuel.

The common commercial hickory nut which is gathered in large quantities for food is produced by this species. A form with a very thin shell, known as Hale's paper shell hickory, is being planted in many places for its fruit.

10. SOUTHERN SHELLBARK — *Hicoria carolinæ-septentrionalis* Ashe

Carya carolinæ-septentrionalis C. K. Schneider

An inhabitant of valleys, or seldom on dry hills, from Delaware to Kentucky, south to Georgia and Alabama, attaining a maximum height of 40 meters, with a trunk diameter of 1.2 m.

The branches are short and stout, forming a narrow cylindric tree. The gray bark is 6 to 20 mm. thick, separating into persistent strap-like plates often 3 dm. long. The twigs are very slender, smooth, glaucous, and purplish brown. The terminal buds are ovoid-lanceolate, 6 mm. long, tapering into a blunt point, their scales imbricated, light brown and shining; the inner scales grow to a length of 5 cm., are taper-pointed, and yellow; the lateral buds are oblong, blunt, and very small. The leaves are 1 to 2 dm. long; the leaf-stalk is slender, rounded, and nearly smooth, the leaflets 3 or 5, lanceolate, sometimes very narrow, 6 to 15 cm. long, somewhat curved, gradually narrowed or rounded at the unequal, sessile base; they are long taper-pointed, coarsely toothed and hairy-fringed on the margin, thin and firm, dark green above, yellowish green and shining beneath. The upper leaflets are sometimes twice as long as the lower; the terminal leaflet is short-stalked; the leaves become characteristically dull yellow or dull brown in early autumn. The staminate catkins are in short-stalked clusters of 3, loosely flowered; bract nearly smooth, much longer than the lobes of the perianth; stamens 4. The pistillate flowers are mostly 2 together, oblong, yellowish hairy. The fruit is subglobose, 1.5 to 3 cm. in diameter, reddish brown; the husk is relatively thick, splitting completely into 4 valves; nut flattened, 4-angled, ovoid, pointed at the end and nearly white, or brownish; shell thin; seed large and sweet.

The wood is hard, tough and strong, close-grained and light reddish brown.

This tree has long been confused with the Shellbark hickory from which it differs in its thin twigs, smaller buds, and narrower leaflets.



FIG. 192. — Southern Shellbark.

II. SMALL FRUITED HICKORY — *Hicoria microcarpa* (Nuttall) Britton

Juglans squamosa microcarpa Barton. *Carya microcarpa* Nuttall

Hicoria glabra odorata Sargent

This Hickory occurs in rich woods from Massachusetts to Michigan, southward to Missouri and Georgia. It is also known as Small pignut hickory, Little pignut hickory, Little shagbark, and Balsam hickory.

The trunk and branches are similar to those of the Pignut hickory. The bark is close and furrowed on young trees, but on old trunks it is shaggy, in thin plates. The twigs are rather slender, long hairy at first, becoming quite smooth, except

for a few light-colored warts, dark brown or gray. The terminal bud is ovoid, blunt, about 15 mm. long, its scales 6 to 8, imbricated, the outer reddish brown and leathery, the inner hairy and continue to grow when the leaf expands, becoming 2.5 to 3.5 cm. in length. The leaves are 2 to 3 dm. long; leaf-stalk stout and channeled; leaflets 5 to 7, oval, oblong or ovate, 6 to 14 cm. long, narrowed or rounded at the unequal, sessile base, sharp or taper-pointed, coarsely but shallowly toothed on the margin; thick and firm at maturity, light green and shining above; the upper pairs are much the largest; the terminal one is broadest above the middle, narrowly tapering at the short-stalked base. The staminate catkins are in stalked clusters of 3, smooth or nearly so, the bract of the perianth slightly if any longer than the rounded lateral lobes, which are fringed with hairs. The pistillate flowers are angular and covered with

scurfy hairs. The fruit is subglobose, 2 to 2.5 cm. in diameter, light brown, densely scaly and slightly winged; husk thin, tardily splitting one or two ways to the base; nut buff-colored, slightly flattened, sharp-pointed, sometimes slightly angular; shell rather thin; seeds small and sweet.

Its wood is similar to that of the Shellbark hickory, and makes excellent fuel.

12. NORTHERN HICKORY — *Hicoria borealis* Ashe

A small tree of dryish hillsides, growing with the Small-fruited hickory in the vicinity of Detroit, Michigan, and probably in adjacent Ontario.

The trunk and branches much resemble the Small-fruited hickory. The bark is deeply furrowed into narrow ridges, which become loose and shaggy with age. The twigs are slender, smooth, and bright brownish red; the terminal bud is ovoid-lanceolate, covered by 8 to 10 imbricated scales, the inner ones being lighter colored and silky. The leaves are 2 to 2.5 dm. long; the leaf-stalk is stout, grooved, thickened at the base, and slightly hairy; leaflets 5, sometimes but 3, lanceolate, 9 to 15 cm. long, or the lowest somewhat smaller, slightly curved, tapering on one side, rounded



FIG. 194. — Northern Hickory.

on the other at the nearly or quite sessile base, narrowed to the sharp-pointed apex, finely toothed on the margin; the terminal leaflet is rather long-stalked; they are thin and densely scurfy beneath when unfolding, becoming thick and firm, dark green above, paler with a few resinous globules beneath. The staminate catkins are numerous in slender stalked clusters of 3; the lobes of the perianth are rounded, much shorter than the narrow bract. The fruit is ovoid, much flattened, 1.5 cm. long or more, light brown and scurfy, terminated by the persistent remnants of the style, and slightly winged; the husk is very thin and leathery, rough, splitting with difficulty or not at all, scarcely angular; nut compressed, nearly white; seed large and sweet.

This hickory has been found in only a limited area and is as yet little known.

13. PIGNUT HICKORY — *Hicoria glabra* (Miller) Britton

Juglans glabra Miller. *Carya porcina* Nuttall

A tree of drier ground than that in which most other hickories grow, occurring from Maine to Minnesota and Kansas south to Florida and Texas. Its maximum height is 35 meters, with a trunk diameter of 1.5 m. It is also called Pignut, Bitternut, Black hickory, Brown hickory, Broom hickory, Hardshell, Switch bud hickory, and White hickory.

The trunk is slender, branched above. The branches are short, spreading, or the lower often drooping, perfect trees being oblong in shape. The bark is rough, 12 to 20 mm. thick, shallowly fissured into broad close scaly ridges. The twigs are slender, slightly angular, light green, often covered by soft yellowish hairs, soon becoming smooth or nearly so, light reddish brown and marked by many lenticels and small leaf scars, finally dark brown. The terminal buds are about 6 mm. long, ellipsoid, sharp or blunt, two or three times larger than the lateral ones and covered by imbricated, sharp-pointed, brown, shining scales; the inner scales are covered with thick, silky hairs, and often grow to 5 to 7 cm. long, becoming more or less curled and reflexed. The leaves are 1.5 to 3 dm. long; the leaf-stalk is slender, smooth, or slightly hairy, somewhat grooved and enlarged at the base; leaflets 3 to 7, rarely 9, oblong or oblong-lanceolate, 7 to 15 cm. long, the upper largest, rounded or narrowed at the base, which is sessile or nearly so; they are taper-pointed, and sharp-toothed; the terminal leaflet is the broadest and tapers from above the middle to the slender leaf-stalk, which is about 12 mm. long; they are brownish green, hairy, and glandular when unfolding, becoming thick and firm,



FIG. 195. — Pignut Hickory.

yellowish green and smooth above, paler, often yellowish brown, and smooth except for a few tufts of hairs at the junction of the principal veins beneath. The staminate catkins are 6 to 10 cm. long, in short-stalked clusters of 3; their sharp-pointed bracts are smooth, equalling or a little longer than the lateral lobes of the perianth, which are ovate and rounded; stamens 4, their anthers nearly sessile, ovate, notched, hairy above the middle. The pistillate flowers are in spikes of 2 to 5, 6 mm. long, 4-angled and nearly smooth. The fruit is subglobose to obovoid or pear-shaped, 3.5 to 5 cm. long, often depressed at the top, reddish brown, nearly smooth; its husk is rather thin, tardily separating into valves after falling from the tree; the nut is ellipsoid to nearly globular, very slightly 4-angled, rounded at each end, sometimes compressed; shell thick; the seed is small, deeply divided and grooved, bitter and astringent.

The wood is hard, tough and strong, elastic and close-grained; its specific gravity is about 0.82. It is used like the Shellbark hickory, from which it is not distinguished in the lumber trade. Pioneer brooms were made by splitting small saplings into thin strips.

This tree varies greatly. A form with larger hairy leaves and larger fruit, occurs from Virginia to Georgia and is known as *Hicoria glabra hirsuta* Ashe; it may be a distinct species.

14. WOOLLY PIGNUT—*Hicoria villosa* (Sargent) Ashe

Hicoria glabra villosa Sargent. *Carya villosa* C. K. Schneider

This tree grows in open, low sandy or rocky woods in Missouri and Arkansas,



FIG. 196. — Woolly Pignut.

reaching a maximum height of 15 meters, with a trunk diameter of 6 dm. It is also called the Scurfy hickory and doubtless receives some of the names applied to the Pignut, with which it is usually confounded.

The trunk and branches resemble the Pignut. The bark is 12 to 20 mm. thick, deeply furrowed into broad, irregularly confluent ridges of a dark brown color. The twigs are slender, covered with pale hairs, and silvery resin-glands, becoming smooth, bright purplish brown, and marked by few lenticels and roundish leaf scars, finally dark brown; the terminal buds are ovoid, sharp-pointed, 3 to 6 mm. long, their scales imbricated, bearing many yellow resinous glands; the lateral buds are very small. The leaves are 1 to 3 dm. long, the leaf-

stalk slender, brownish hairy, becoming nearly smooth by autumn; leaflets varying

from 5 to 9, usually 7, oblong to oblong-oval or oblanceolate, 8 to 12 cm. long, nearly straight, tapering to the unequal base, sessile or nearly so, taper-pointed, coarsely toothed from base to apex, hairy beneath and bearing some round resin glands, becoming dark green and smooth above, paler or light yellow, with a stout, hairy midrib beneath; the upper leaflets are about twice as large as the lowest. The staminate catkins are in stalked clusters of 3, glandular and scurfy, from 5 to 10 cm. long. The pistillate flowers are oblong, 4-ribbed, yellowish hairy. The fruit is subglobose to pear-shaped 2 to 4.5 cm. long, 4-winged, dotted with resinous globules, and yellowish scurfy; husk thin, splitting to near the base; nut brownish, slightly angled and flattened, narrowed at both ends, thick shelled, the seed small and sweet.

The wood is hard, rather brittle but tough, close-grained, reddish brown. It is used for the same purposes as that of the other hickories.

THE BIRCH FAMILY

BETULACEÆ Agardh



IX genera compose this family, including about 80 species of trees and shrubs, mostly indigenous to the cooler portions of the northern hemisphere, where they are of considerable economic importance. The wood of several species of Alders is highly prized by gunpowder manufacturers, as the source of very superior charcoal; their bark is also valued in tanning and to some extent as an astringent medicine. The fruits of most of the species of *Corylus*, variously known as Filberts or Hazelnuts, are important as food. Some of the Birches, especially *Betula lenta* yield an aromatic volatile oil of importance in medicine and as a flavoring agent. The bark of *Betula papyrifera* was of considerable importance in former times as a material for canoe-building.

The Betulaceæ have alternate deciduous simple leaves, with usually deciduous stipules. The small flowers are monœcious; the staminate in long, usually drooping catkins, solitary or in clusters of 2 or more, in the axils of numerous bracts, with or without a perianth, stamens 2 to 10, their filaments separate, anthers 2-celled, the sacs sometimes distinct on a 2-forked filament. The pistillate inflorescence is of spike-like or capitate catkins, the flowers with or without a perianth; perianth, if present, adnate to the 1- or 2-celled ovary; style 2-cleft or divided; ovules 1 or 2 in each cell, pendulous. The fruits are mostly small, 1-celled, 1-seeded nuts or samaras, subtended by usually enlarged bracts, forming a cone-like structure called a strobile; seed coat membranous; endosperm none; cotyledons fleshy.

Our genera are:

Staminate flowers solitary in the axil of each bract, without a perianth; pistillate flowers with a perianth.

Staminate flowers without bractlets; pistillate flowers numerous, spicate; nut small, subtended by a large bract.

Fruit-bracts flat, leaf-like, 3-lobed.

Fruit-bracts closed, membranous.

Staminate flowers with bractlets; pistillate flowers few, in heads; nut large, in a leaf-like involucre.

Staminate flowers 2 or more in the axil of each bract, with a perianth; pistillate flowers without a perianth.

Stamens 2; bracts of the ripe fruit membranous and deciduous with the nut.

Stamens 4, sometimes 3 to 6; bracts of the ripe fruit woody and persistent after the nut has fallen out.

1. *Carpinus*.

2. *Ostrya*.

3. *Corylus*.

4. *Betula*.

5. *Alnus*.

I. AMERICAN HORNBEAM

GENUS **CARPINUS** [TOURNEFORT] LINNÆUSSpecies **Carpinus caroliniana** Walter

CARPINUS is the ancient name of the European hornbeam, *Carpinus Betulus* of Linnæus, the type of the genus. About 12 species are known, most of them natives of northern and central Asia, *C. caroliniana* being the only one indigenous in America. This tree occurs in moist woodlands, especially along streams and swamps, from Nova Scotia to Florida, extending westward to Ontario, Minnesota, Kansas, and Texas; it also exists in mountainous parts of Central America and southern Mexico, but it is possible that this is, however, a different species. The American hornbeam is usually low, with a rounded top, occasionally becoming about 12 meters high, with a trunk 6 dm. thick, and is sometimes reduced to shrubby forms. It is also called Blue beech and Water beech, its smooth, gray bark resembling that of *Fagus*.

The trunk is characteristically obtusely ridged or fluted; the bark thin, smooth grayish brown, and very close. The very slender young twigs are silky-hairy and green, becoming smooth, reddish or orange, shining and ultimately gray-brown and dull. The buds are pointed, their scales finely hairy. The leaves are ovate-oblong, pointed, often long-pointed, sharply doubly toothed, somewhat unequal-sided, 6 to 10 cm. long, with nerves sunken in the upper surface and prominent on the lower; when young they are silky-hairy, when mature smooth and dull bluish green on the upper side, yellow green and hairy along the veins beneath; the slender leaf-stalks are hairy and about 9 mm. long, the stipules hairy, ovate, and pointed. The very small staminate and pistillate flowers are borne in separate catkins on the same tree, and open from March to May. The staminate catkins are very densely flowered, narrowly cylindric, and droop at or near the ends of short branches of the preceding season; they are stalkless and 2 or 3 cm. in length; each of the flowers consists of several stamens, which are attached to the base of an ovate scale; the filaments of the stamens are short and two-forked, each fork bearing an anther-sac which has a tuft of hairs at its tip. The pistillate catkins are at the ends of shoots of the season and are loosely several-flowered; there are two flowers at the



FIG. 197. — American Hornbeam.

base of each scale, subtended by a bract and very minute bractlets; the calyx is toothed, crowning the 2-celled ovary, which is surmounted by 2 elongated, narrow stigmas. The scales fall away early, and the fruiting catkins are composed of the persistent bracts which become very much enlarged, about 2.5 cm. long, leaf-like, and 3-lobed, the middle lobe much longer than the lateral ones and toothed on one edge, all three strongly veined; the nut is ovoid, somewhat flattened, ribbed, and about 4 mm. long.



FIG. 198. — American Hornbeam, New York Botanical Garden.

The tree is of slow growth but very ornamental; its leaves turn orange and scarlet in the autumn. The wood is dense, hard, and very difficult to work, so that its uses are of little importance; it is light brown, and has a specific gravity of about 0.73.

II. THE HOP HORNBEAMS

GENUS **OSTRYA** [MICHELI] SCOPOLI



OSTRYA is the ancient appellation of the European hop hornbeam *Ostrya Ostrya* (Linnæus) MacMillan. Six species are known, the three here described, one in Mexico, the typical European one, which extends into western Asia, the sixth a native of Japan. They are all small trees, with hard wood and scaly bark.

The leaves are alternate, ovate, obovate, or oblong-lanceolate, toothed, stalked and stipulate, the stipules falling away soon after they unfold. The very small, imperfect staminate and pistillate flowers are borne in separate catkins on the same tree (monœcious), and open with or before the leaves. The staminate ones are in dense narrow drooping catkins, like those of the Hornbeams, consisting only of several stamens, each stamen 2-forked. The pistillate flowers are in short, erect catkins, 2 together on the base of each scale, each subtended and enclosed by a tubular hairy bract; there is a minute, toothed calyx crowning the ovary, a short style and 2 long narrow stigmas. In ripening the tubular bract becomes greatly enlarged, nerved, and bladder-like, loosely enclosing the ovoid, somewhat flattened nut, the mature catkins resembling hops, whence the common name.

The North American species may be distinguished as follows:

Leaves long-pointed, 6 to 15 cm. long; fruit of many hollow bracts; eastern tree.

1. *O. virginiana*.

Leaves blunt or short-pointed, 5 cm. long or less; fruit of few hollow bracts; Arizona tree.

2. *O. Knowltoni*.

1. IRONWOOD — *Ostrya virginiana* (Miller) Willdenow

Carpinus virginiana Miller

The Ironwood, or American hop hornbeam, occurs mostly in dry woods, ranging from Cape Breton island to northern Florida, west to Ontario, Minnesota, South Dakota, Kansas, and Texas; it is not common near the Atlantic coast south of New York. It attains a maximum height of about 20 meters, with a trunk up to 6 dm. thick.

The bark is thin, light brown, and flakes off in small plates. The branches are slender, the lower ones widely spreading, perfect specimens of the tree being round-topped and often as broad as high. The young twigs are green and hairy, becoming smooth, brown, and shining. The pointed buds are about 6 mm. long, their scales ovate and finely hairy. The leaves vary from ovate to ovate-oblong or oblong-lanceolate, and from 6 to 15 cm. in length; they are thin and tough, sharply doubly-toothed, usually long-pointed, smooth and dull



FIG. 199. — Ironwood.

green on the upper surface, beneath pale green, somewhat hairy on the veins and with tufts of hairs in their axils; the leaf-stalks are 2 to 8 mm. long, the narrow concave stipules about 1 cm. long and hairy. The tree flowers in April or May,

or, at its northern range, in early June. The clustered staminate catkins are 3 to 8 cm. long, their scales triangular-ovate and long-pointed. The ripe pistillate hop-like catkins (strobiles) are oblong, 7 cm. long or less, stalked, the bladder-like bracts 12 to 16 mm. long, pointed, hairy, long-hairy near the base, finely netted-veined; the nut is 5 to 8 mm. long.

The tree is of rather rapid growth and well adapted to lawn and park planting. The wood is very strong and tough, close-grained, hard, light reddish brown, with a specific gravity of about 0.83; it is used for tool-handles, mallets, levers, and fence-posts.

2. KNOWLTON'S HOP HORNBEAM — *Ostrya Knowltoni* Coville

This is one of the most locally distributed of all trees, being only known to occur in the Grand cañon of the Colorado River in Arizona, where it is plentiful at a few places. Trees 10 meters high have been observed with trunks about 4.5 dm. in diameter near the base; the main trunk is usually very short and divides a little above the ground into several stout, nearly upright branches, the smaller branches being very irregular and drooping.

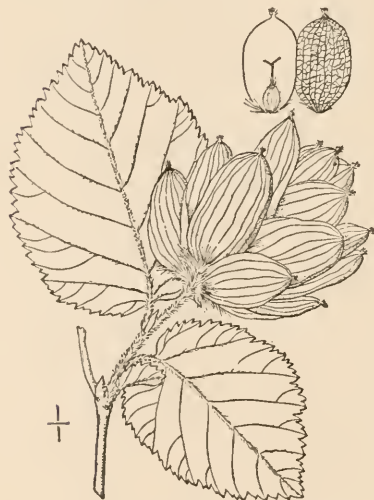


FIG. 200. — Knowlton's Hop Hornbeam.

The flowers appear in May. The staminate catkins are 2 to 3 cm. long, their scales broadly ovate and rather abruptly pointed. The ripe pistillate catkins are about 3 cm. long, stalked, with fewer bladder-like bracts than those of the eastern tree; the nut is about 6 mm. long.

The wood is hard, close-grained, and light reddish brown.

Bailey's Hop hornbeam (*Ostrya Baileyi* Rose) recently described from the Guadalupe Mountains, Texas, differs in the more glandular petioles and darker brown twigs. It is only known from meager specimens, and its fruit is as yet undescribed.

III. CALIFORNIA HAZELNUT

GENUS **CORYLUS** [TOURNEFORT] LINNÆUSSpecies **Corylus californica** (A. de Candolle) Rose*Corylus rostrata* var. *californica* A. de Candolle

THIS is an under shrub or small tree of wooded hillsides, from middle California northward through Oregon to Washington, attaining a height of 12 meters, with a trunk diameter of 2.5 dm.

The twigs are slender and round, with long, often glandular hairs, but become nearly smooth with age and red-brown or dark gray. The buds are small, blunt, and covered with densely hairy scales. The leaves are alternate, firm, broadly ovate to nearly orbicular, 2.5 to 7 cm. long, sharp or slightly taper-pointed, heart-shaped or rounded at the base, incised and toothed or doubly toothed on the margin, dark green, rough, and somewhat hairy above, paler and softly hairy beneath, the venation prominent on both surfaces; leaf-stalk slender, very hairy, 6 to 8 mm. long. The flowers are monœcious, the staminate on twigs of the previous season in cylindric drooping very hairy-scaled catkins, 3 to 4 cm. long; the 4 to 8 stamens are inserted on a hairy receptacle with 2 bracts, the filaments short, 2-forked, each with a hairy-tipped anther-sac. The pistillate flowers are borne on short branchlets of the season's growth, in short, erect clusters, each bract protecting an incompletely 2-celled ovary joined to the calyx; the 2 styles are short, erect, supporting a slender stigma; the 2 bractlets unite and grow into a short, tubular beaked, bristly involucre enclosing the fruit, which is an ovoid nut, about 1.5 cm. in diameter, with a thick, hard bony dark brown shell, enclosing a sweet oily edible seed. It differs from the Beaked hazelnut, *Corylus rostrata* Aiton, a common northern shrub, which at the north extends almost across the continent, in its shorter beak, more prominently ribbed and much less bristly involucre, and blunter leaves, which like the twigs are much more hairy.



FIG. 201. — California Hazelnut.

The wood of the California hazelnut is hard, close-grained, and brown; it takes a fine polish and is used on the Pacific slope for shoe-pegs, basketry, and barrel hoops; coarse brooms were made of the branches by the pioneers. The nut is gathered for food as are other hazelnuts.

The genus comprises about 7 species, mostly shrubs, indigenous to the northern hemisphere; two of them are well-known shrubs of the north and eastern United States. The popular Filbert of commerce is the nut of the European Hazelnut, *Corylus Avellana* Linnæus, the type of the genus, and cultivated in a number of improved varieties; over a dozen fossil species of the genus have been described. The name is Greek in reference to the helmet-like involucre surrounding the nut.

IV. THE BIRCHES

GENUS **BETULA** [TOURNEFORT] LINNÆUS



ABOUT 35 species of birches are known, some 25 of them trees, the others shrubs. They are widely distributed throughout the north temperate and subarctic zones, some of the shrubby kinds extending as far northward as any woody plants. In North America, besides the fifteen trees here described, there are four or five kinds of shrubs. *Betula* is the ancient Latin name; *B. alba* Linnæus, the European White birch, is the type of the genus.

The bark and wood contain an aromatic volatile oil. The wood is close-grained, hard, and tough, that of all the birch trees being good fuel. The leaves are variously toothed, rarely lobed or incised, and are stalked, pinnately veined, and stipulate, the small stipules falling away as the leaves unfold in spring. The minute monœcious flowers are in dense catkins, opening in very early spring, before or as the leaves unfold. The staminate catkins at flowering time are long and drooping, the pistillate ones shorter, upright or spreading. The staminate flowers are borne at the bases of the scales of the catkin and consist of a 4-toothed or 2-toothed calyx and 2 stamens with short, 2-forked anthers, each fork bearing an anther-sac. The pistillate flowers are usually 2 or 3 together at the base of each scale of the catkin; they consist only of a 2-celled ovary, surmounted by 2 long styles stigmatic near the tip. The ripe pistillate catkins (strobiles) consist of the leathery 3-lobed scales, bearing the minute flat membranous-winged nuts, and these fall away together from the slender axis.

Fruiting catkins slender-stalked.

Bark of the trunk chalky white (rarely darker in *B. papyrifera*).

Leaves deltoid or rhombic.

Leaves long-acuminate; eastern trees.

Leaves bright green, shining, irregularly toothed.

Leaves dull blue-green, regularly toothed.

Leaves short-acuminate; northwestern tree.

Leaves ovate; strobile-scales not hairy-fringed.

Leaves rounded or narrowed at the base.

Leaves cordate at the base.

Bark of the trunk brown to red-brown or green-brown.

Leaves ovate to ovate-orbicular; western trees.

Tall trees with incised-serrate leaves.

Leaves rounded at the base, finely serrate.

1. *B. populifolia*.

2. *B. carulea*.

3. *B. alaskana*.

4. *B. papyrifera*.

5. *B. cordifolia*.

6. *B. occidentalis*.

Leaves cuneate at the base, coarsely serrate.

Small trees or shrubs with serrate leaves.

Lateral lobes of the strobile-scales ascending or erect, shorter than the middle one.

Lateral lobes of the strobile-scales spreading, as long as the middle one or a little longer.

Strobiles over 1 cm. thick; lateral lobes of their scales pointed.

Strobiles narrowly cylindric, less than 1 cm. thick; lateral lobes of their scales rounded.

Leaves rhombic to rhombic-ovate, acute at both ends or broadly cuneate at the base.

Leaves gray-tomentulose beneath; strobile-scales lobed at the apex; nut ovate-orbicular, 3 to 4 mm. long, much wider than its wings.

Leaves green and glandular beneath; strobile-scales lobed nearly to the middle; nut 1.5 to 2 mm. long, about as wide as its wings or narrower.

Fruiting catkins sessile or very short-stalked at the ends of short branches; eastern trees.

Fruiting scales 4 to 5 mm. long; leaves mostly cordate.

Fruiting scales glabrous; bark dark brown, close.

Fruiting scales ciliate; bark rough or peeling, gray to yellow-brown.

Fruiting scales 8 to 10 mm. long, hairy, ciliate; bark yellow-gray; leaves rarely cordate.

7. *B. kenaica*.

8. *B. fontinalis*.

9. *B. utahensis*.

10. *B. Phiperi*.

11. *B. nigra*.

12. *B. Sandbergi*.

13. *B. lenta*.

14. *B. alleghanensis*.

15. *B. lutea*.

1. GRAY BIRCH — *Betula populifolia* Marshall

A slender tree, usually growing in clusters in moist soil, along streams or swamps, but also occurring on upland hillsides. It extends from Prince Edward island to Delaware, westward to western New York, eastern Pennsylvania, and, according to a specimen collected by Dr. Short, also to Kentucky; it is most abundant near the coast. It attains a maximum height of about 14 meters, with a trunk diameter of 4 to 5 dm. When growing along the borders of woods the trunk bends away from the neighboring trees; it is very flexible and is often bent to the ground by snow. The tree is also known as American white birch, and Old field birch.

The outer bark is chalky white, the trunks being thus very conspicuous in winter landscapes; it does not peel off readily; the inner bark is orange-yellow and about 6 mm. thick on old trunks. The young twigs are



FIG. 202. — Gray Birch.

green and warty-glandular, becoming smooth and yellowish to reddish brown. The buds are ovoid, 4 mm. long. The leaves are triangular-ovate to rhombic-ovate, hairy, at least on the veins of the lower surface when young, nearly or quite smooth when fully grown, irregularly and often doubly toothed, and taper into a long toothed tip; they are blunt or truncate at the base, bright green and shining above, pale green beneath, and vary from 3 to 7 cm. in length; the very slender



FIG. 203.—Gray Birch, Van Cortlandt Park, N. Y. City.

leaf-stalks are 1.5 to 3 cm. long, stipules ovate and pointed. The leaves quiver in a light breeze, like those of *Asp.* The tree flowers in April or May. The staminate catkins are 5 to 10 cm. long, usually solitary, rarely two together. The ripe pistillate catkins (strobiles) are cylindric, 1.5 to 3.6 cm. long, on stalks about 1 cm. long; their scales are finely hairy, 2 to 4 mm. long, the lateral lobes larger than the middle one; the nut is oval, about 2.5 mm. long, and narrower than its wings.

The wood is light brown, soft and weak, with a specific gravity of about 0.58;

it is used for barrel-hoops, shoe-pegs, largely for spools, and somewhat for paper-pulp. The tree grows fast but is short-lived.

2. BLUE BIRCH — *Betula cœrulea* W. H. Blanchard

This recently described species is very closely related to the Gray birch, and is reported from moist mountain sides at altitudes of about 550 meters in Vermont and Maine, and probably occurs in similar situations throughout the north-eastern portion of our area. It reaches a height of 20 meters, with a trunk diameter of 4.5 dm. in its large-leaved form, or about half these dimensions in the smaller-leaved form.

The rather small branches are nearly upright at first, but become spreading. The bark is about 6 mm. thick, its outer layer somewhat shining, white with a reddish tinge, the inner bark yellowish. The twigs are slender, slightly long-hairy and purplish at first, becoming reddish brown and quite smooth, except for numerous pale lenticels. The leaves are ovate, 5 to 7 or 9 cm. long, sharply and quite regularly toothed toward the long, taper-pointed apex, quite entire near the rounded or wedge-shaped, sometimes unequal base, pale glandular at first, soon



FIG. 204. — Blue Birch.

becoming smooth and dull bluish green above, pale yellowish green and slightly hairy along the principal veins beneath; the leaf-stalk is slender, 2 to 3 cm. long, often reddish. The staminate catkins, sometimes in pairs, are cylindric, 3 to 5 cm. long or longer. The fruiting catkins are drooping, slender, cylindric, 2 to 3 cm. long, slightly tapering at the blunt apex, their stalks about 1 cm. long. The nut is oval, its wing much broader than the body.

The large form with leaves more rounded at the base, thicker fruiting catkins, and generally larger in all its parts, has been called *Betula cœrulea-grandis* by Blanchard, and *B. cœrulea* var. *Blanchardi* by Sargent.

3. ALASKA BIRCH — *Betula alaskana* Sargent

The Alaska birch, abundant in the interior of Alaska and the Yukon Territory, extends southward to the Saskatchewan valley and eastward to the Mackenzie River and perhaps to Quebec. It is said to occur also on the Alaskan coast.

It is reported to grow to a height of about 26 meters, with a trunk 3 or 4 dm. thick, but it is usually much smaller. It inhabits mountain sides and river banks.

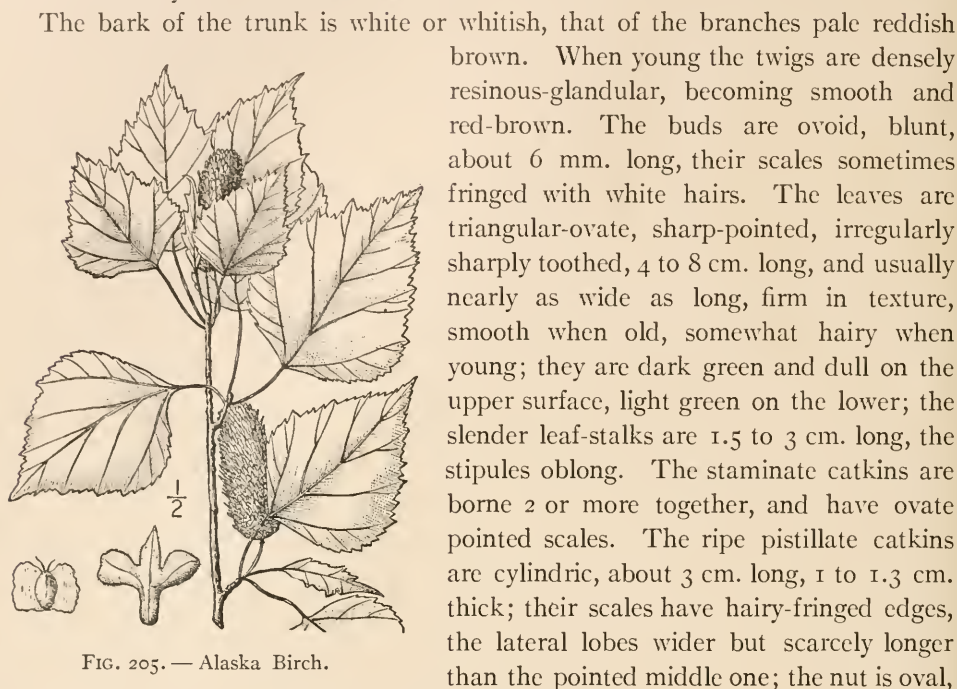


FIG. 205. — Alaska Birch.

about 2 mm. long, its wings rather broader than the body.

It has been proposed to unite this species with the *Betula pendula* Roth, of northern Europe and Asia, but the foliage of the two seems abundantly distinct. It has formerly been erroneously considered as identical with the *Betula alba verrucosa* var. *resinifera* of northeastern Asia, and the name *B. resinifera* Britton has been proposed for it.

4. PAPER BIRCH — *Betula papyrifera* Marshall

The Paper birch, or Canoe birch, grows mostly in forests, and ranges from Newfoundland to Alaska, south to New Jersey, Pennsylvania, Michigan, Nebraska, Colorado, and Washington, thus extending nearly or quite across the continent; its leaf-form is somewhat variable, and it has been held by various authors as identical with the White birch of Europe (*Betula alba* L.), but an examination of the two trees growing side by side will at once demonstrate that, while similar, they are different. It attains a maximum height of about 25 meters, with a trunk diameter of about 7 dm. *B. Andrewsii* A. Nelson, is probably not distinct.

The bark is usually bright white outside, orange or yellow within, quite thick, and peels off readily in thin layers; at the bases of old trees it is often black and rather deeply fissured, and there are often black bands higher up on the trunks. The young green twigs are a little viscid and quite hairy; they become smooth and

red-brown, and, after several years' growth, bright white like the trunk. The buds are ovoid, pointed, about 7 mm. long, somewhat hairy and resinous. The leaves are ovate, 3 to 11 cm. long, sharply irregularly toothed, rather firm in texture, hairy when young, and hairy in the axils of the veins beneath even when old, the upper surface dark green and dull, the under side light green; they are either rounded or narrowed at the base; the leaf-stalks are 1.5 to 3 cm. long, the stipules ovate, pointed, and hairy-fringed. The flowers open with or before the leaves in April or May. The staminate catkins are borne 2 or 3 together and vary from 5 to 10 cm. long, their scales triangular-ovate and finely hairy. The ripe pistillate catkins are cylindric, 2 to 5 cm. long, with stalks 1 to 2 cm. long; their scales are 4 to 6 mm. long, smooth or finely hairy, their lateral lobes shorter than or as long as the middle one; the oblong or oval nut is somewhat narrower than its wings.

The wood is light brown, strong and tough, with a specific gravity of about 0.60; it is largely used for spools, and also for shoe-pegs and paper-pulp; it was utilized for a variety of purposes by the northern Indians, who also employed the bark extensively for canoes, baskets, and cups, and for sheathing wigwams. The tree is of rapid growth but does not yield readily to cultivation much to the south of its area of natural distribution.



FIG. 206. — Paper Birch.

5. HEART-LEAVED PAPER BIRCH — *Betula cordifolia* Regel

This tree closely resembles the widely distributed Paper birch, except in the form of its leaves. It is smaller than that species, perhaps reaching a maximum height of not more than 14 meters, with a trunk 2 dm. thick. It occurs in the northern and mountainous parts of North America, extending from Newfoundland to British Columbia, Maine, northern New York, Iowa, Idaho, and Washington.

The outer bark is bright white, the inner orange-yellow; it peels readily. The young twigs are green and sometimes glandular, becoming brown. The leaves



FIG. 207. — Heart-leaved Paper Birch.

are broadly ovate, rather long-pointed, heart-shaped at the base, 5 to 9 cm. long, sharply toothed, the upper surface dark green and smooth, the lower pale green and hairy in the axils of the veins. The ripe pistillate catkins are cylindric, 2 to 4 cm. long, their scales smooth; the oblong nut is narrower than its wings.

The tree may be only a form of *Betula papyrifera* Marshall, with heart-shaped leaves, and it has been considered as a variety of that species. On mountain summits in New England and New York it is reduced to a mere shrub not over one meter high.

6. WESTERN BIRCH — *Betula occidentalis* Hooker

This is the largest American birch, and one of the largest of all deciduous-leaved trees, attaining a maximum height of about 40 meters, with a trunk diameter of a meter or more. It occurs in British Columbia and Washington, extending eastward to Montana, inhabiting moist soil.



FIG. 208. — Western Birch.

The outer bark is yellowish brown and shining, peeling off readily; the inner bark is bright orange-yellow. The young twigs are brownish, loosely hairy with long hairs, glandular, becoming smooth, orange-brown and shining. The pointed buds are about 6 mm. long. The leaves are ovate, sharply and rather coarsely toothed, commonly doubly toothed, pointed, thin, 10 cm. long or less, usually rounded or somewhat heart-shaped at the base, glandular, and furnished with long whitish hairs along the veins when young, and with tufts of hairs in the axils of the veins beneath when old; the stout leaf-stalks

are 1 to 2 cm. long; the stipules are oblong and about 2 cm. long. The tree flowers in May. The staminate catkins are 7 to 10 cm. long, their scales hairy-fringed. The ripe pistillate catkins are oblong-cylindric, 3 to 4 cm. long, stalked, their finely hairy scales fringed on the edges, the middle lobe narrower and somewhat longer than the lateral ones; the nut is oval and narrower than its wings.

7. KENAI BIRCH — *Betula kenaica* Evans

This tree, named from specimens collected on the Kenai peninsula, inhabits only the coast of Alaska; it is there known also as Red birch and Black birch; it attains a height of about 13 meters, with a trunk up to 5 dm. thick.

The thin bark peels off readily in layers; it is dark brown on large trunks, grayish or reddish on young trees and on the branches of old ones; the young twigs are

glandular, reddish brown, shining, becoming gray-brown; the winter buds are ovoid, pointed, 5 or 6 mm. long. The leaves are ovate, mostly broadly ovate, 6 cm. long or less, and often nearly as wide as long, a little hairy when very young, smooth when old; the upper surface dark green, not shining, the under side paler green; they are pointed at the apex, obtuse or nearly truncate at the base, sharply and rather coarsely irregularly toothed, their slender stalks 1.5 to 2.5 cm. long. The staminate catkins are borne 2 or 3 together; they are about 2.5 cm. long, their scales ovate and pointed; the pistillate catkins are glandular-stalked and shorter, in fruit becoming about 2 cm. long and 5 mm. in diameter, their scales about 3 mm. long, hairy-margined, the middle tooth pointed, rather narrower than the lateral ones but about as long; the thin oblong nut is about 2 mm. long and about as wide as its membranous wing.

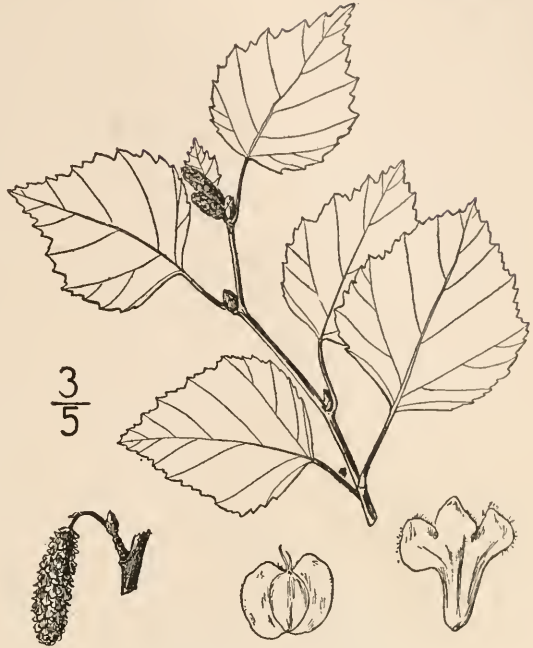


FIG. 209. — Kenai Birch.

8. WESTERN RED BIRCH — *Betula fontinalis* Sargent

This birch is a tree sometimes 14 meters high, with a trunk 4 to 5 dm. in diameter, and grows principally along rivers, especially in cañons, ranging from British Columbia to Saskatchewan, south to California, Utah, New Mexico, western Nebraska, and South Dakota. It often forms very dense thickets, growing as a shrub, and flowering when only a few meters high. The species was formerly confused with *Betula occidentalis* Hooker, and it has recently been argued that it is identical with *B. microphylla* Bunge, of the Altai Mountains in Russia.



FIG. 210. — Western Red Birch.

The bark is smooth, dark bronze in color, shining, and about 7 mm. thick.

The branches are slender and usually droop; the young twigs are resinous-glandular, orange-brown, becoming red-brown and shining. The buds are about 6 mm. long and resinous. The leaves are ovate, usually broadly so, 2 to 5 cm. long, pointed or bluntish, sharply and sometimes doubly toothed, the base varying from wedge shaped to rounded; they are hairy beneath along the veins when young, nearly smooth when old, dark green and dull on the upper side, yellow-green beneath; the leaf-stalks are 7 to 15 mm. long, the stipules ovate, 1 cm. long or less. The tree flowers in April or May. The staminate catkins are 6 cm. long or less. The ripe pistillate catkins are cylindric, stalked, 2 to 3 cm. long, 1 cm. thick or less, their scales hairy-fringed with ascending or erect lateral lobes mostly much shorter than the middle one; the nut is oval and narrower than its wings.

9. UTAH BIRCH—*Betula utahensis* Britton



FIG. 211. — Utah Birch.

The distribution of this birch is, so far as is known, only in the vicinity of Salt Lake City, Utah.

The young twigs are densely resinous, glandular, greenish brown, becoming bright brown and shining. The young leaves are hairy on both sides, the old ones smooth, except for a few hairs on the veins beneath; they are ovate to ovate-orbicular, sharply toothed with abruptly tipped teeth, pointed, 5 cm. long or less, and sometimes as wide as long, narrowed or truncate at the base, the upper surface dull green, the under side paler. The tree flowers in April and has clustered staminate catkins 5 cm. long or longer. The ripe pistillate catkins are cylindric, stout, 3 or 4 cm. long, more than 1 cm. thick, and are borne on stalks about 6 mm. long; their scales are nearly as wide as long, finely hairy and hairy-fringed, the lateral lobes obliquely ovate,

widely spreading, and about as long as the triangular-lanceolate middle one; the nut is obovate, 2 mm. long, narrower than its wings.

10. PIPER'S BIRCH — *Betula Piperi* Britton

This species inhabits wet soil in eastern Washington and adjacent Idaho. It attains a height of 15 meters and is a slender tree with drooping branches.

The bark is dark bronze in color, thin, and does not peel off readily. The young twigs are very slender, green and glandular, becoming brown or gray-

brown. The leaves are ovate, thin, sharply irregularly toothed, pointed, 5 cm. long or less, bluntly to narrowly wedge-shaped at the base, long-hairy when young, when mature rather dark green, smooth and somewhat shining on the upper surface, pale green and sparingly hairy on the under side; the very slender leaf-stalks are smooth or nearly so, 1 to 2 cm. long, the thin ovate stipules about 5 mm. long. The flowers open in May. The staminate catkins are 6 to 8 cm. long, the ripe pistillate catkins are narrowly cylindric, 3 to 5 cm. long, about 8 mm. thick, borne on stalks about 7 mm. long; their scales are about 6 mm. long, longer than wide, 3-lobed at the top, finely hairy and hairy-fringed, the lateral lobes spreading, rounded, a little shorter than the narrower middle one, the stalk-like part below the lobes wedge-shaped; the nut is 1.5 to 2 mm. long, obovate to oblong and wider than its wings.



FIG. 212. — Piper's Birch.

II. RIVER BIRCH — *Betula nigra* Linnæus

The River birch, or Red birch, grows naturally in moist soil in river valleys and along the borders of ponds and swamps, from southern New Hampshire and Massachusetts to Florida, extending westward to Illinois, Iowa, Minnesota, Nebraska, Kansas, and Texas, thus having a more southern range than any other American species. It reaches a maximum height of about 30 meters and a trunk diameter of 1.5 to 2 meters.



FIG. 213. — River Birch.

The bark is reddish brown and thick; near the bases of old trees it is ridged and scaly, but higher up, and on young trees, it is red-brown to green-brown or gray, and peels off freely in thin layers. The young twigs are greenish and densely velvety, becoming smooth and red-brown. The buds are pointed, hairy, and about 6 mm. long. The leaves are rhombic-ovate, irregularly and often doubly toothed or somewhat lobed, 3 to 8 cm. long, pointed,

rather firm in texture and tough, the base varying from narrowly to broadly wedge-shaped or even truncate; they are long-hairy when young, when mature dark green, smooth, and shining on the upper side, pale and velvety or sometimes

nearly smooth on the under side, except the hairy veins; the hairy leaf-stalks are 1.5 cm. long or less, the stipules ovate. The flowers expand in April or May. The catkins of staminate flowers are 6 to 9 cm. long, mostly in 2's or 3's, their scales ovate and blunt. The ripe pistillate catkins are oblong-cylindric, stalked, 2 to 5 cm. long, about 1 cm. thick, their scales velvety, hairy-fringed, with 3 nearly equal bluntish lobes, or the middle lobe a little longer than the lateral ones; the nut is broadly ovate or oval, 2.5 to 4 mm. long, wider than its wings.

The tree grows rapidly in good soil and is well adapted to park and lawn planting. The wood is light brown, hard and strong, with a specific gravity of 0.58, and is largely used for furniture, ox-yokes, woodenware, and for fuel.

12. SANDBERG'S BIRCH — *Betula Sandbergi* Britton



FIG. 214. — Sandberg's Birch.

This tree, or shrub, inhabits swamps in Hennepin county, Minnesota, and has been confused with *Betula nigra* L. It occurs also in Saskatchewan.

The young twigs are loosely hairy and green, becoming brown. The leaves are rhombic-ovate, pointed, rather evenly toothed, firm, dark green, dull, and finely but strongly netted-veined on the upper side, light green, very glandular and slightly hairy on the veins of the under surface, 6 cm. long or less, the base wedge-shaped; when young they are very glandular on both sides; the slender smooth leaf-stalks are 1.5 cm. long or less. The flowers open when the leaves are partially grown. The staminate catkins (Saskatchewan specimens) are 6 cm. long or longer. The ripe pistillate catkins are slender-stalked, cylindric, 2 to 2.5 cm. long, about 6 mm. in diameter, blunt, their scales about 4 mm.

long, hairy, 3-lobed at the top, the middle lobe a little longer than the blunt ascending lateral ones, the base wedge-shaped; the nut is broadly oval to somewhat obovate, 1.5 mm. long, nearly as wide as its wings.

13. CHERRY BIRCH — *Betula lenta* Linnæus

The Cherry birch, or Black birch, is an upland forest tree, which reaches a maximum height of about 25 meters, with a trunk diameter of nearly two meters. It grows from Newfoundland to northern Florida, west to Ontario, Illinois, and Tennessee. It often inhabits rocky woodlands, its roots embracing large boulders or parts of ledges. It is also called Sweet birch and Mahogany birch.

The bark of young and middle-aged trunks is smooth, close, dark brown and shining, resembling that of a cherry tree, whence the common name; that of old

trunks becomes deeply fissured and broken into plates. The branches, at first, are nearly erect, but the lower ones of older trees widely spreading. The young twigs are green and loosely hairy, becoming smooth, shining, and reddish brown. The buds are about 7 mm. long, pointed and shining. The young leaves are silky-hairy, the old ones hairy only along the veins on the under side; they are ovate or oblong-ovate, thin, pointed, sometimes rather long-pointed, 6 to 12 cm. long, finely and sharply toothed, often doubly toothed, usually cordate but sometimes rounded at the base, bright green and somewhat shining above, pale green beneath, the veins prominent on the under side but inconspicuous on the upper; the leaf-stalks are 6 to 12 mm. long, the stipules ovate, pointed, hairy-fringed. The tree flowers in April or May. The staminate catkins are borne several together and are 6 to 10 cm. long. The ripe pistillate catkins are broadly oblong, blunt, not stalked, 2 to 3 cm. long, their scales 4 or 5 mm. long, smooth, about equally 3-lobed above the middle; the nut is oblong to obovate and rather broader than its wings.



FIG. 215. — Cherry Birch.

The wood is largely used for furniture and makes excellent fuel; it is locally used for boat-building; it is hard, strong, dark brown, with a specific gravity of about 0.76. The wood and bark yield birch oil by distillation, which is nearly identical with oil of wintergreen, used for flavoring, and in medicine as a stimulant. Birch-beer is the fermented sap. The tree grows rapidly, flourishing best when associated with other species.

14. SOUTHERN YELLOW BIRCH — *Betula alleghaniensis* Britton

This tree resembles the Cherry birch and the Yellow birch and has been confused with both of them. It attains about the same size as the former, but is smaller than the Yellow birch, and occurs in woodlands from Massachusetts to Quebec and northern Michigan, south to southern New York, Pennsylvania, and southward in the mountains to Georgia.

Its bark is either close and furrowed or peels off in thin yellowish gray layers. The young twigs are long-hairy and green, becoming brown and shining, ultimately gray and slightly aromatic. The buds are smooth, their scales slightly hairy-fringed. The leaves are ovate or ovate-oblong, usually long-pointed, 12 cm. long or less, sharply and rather coarsely toothed, mostly cordate but sometimes rounded at the base, long-hairy when young, when mature dark green, smooth, and dull above, yellow-green and more or less hairy on the veins beneath. The hairy



FIG. 216. — Southern Yellow Birch.

leaf-stalks are 1 to 1.5 cm. long. The flowers open in May. The clustered staminate catkins are 6 cm. long or longer, their scales broadly ovate and bluntish. The ripe pistillate catkins are oblong-cylindric, 2 to 3 cm. long, very short-stalked or stalkless, their scales 4 to 6 mm. long, more or less hairy, nearly or quite as wide as long, 3-lobed above the middle, the wedge-shaped part below the lobes very short, the edges sparingly long-hairy; the nut is narrowly obovate or oblong, 2 to 3 mm. long. It is also called Gray birch and Water birch.

15. **YELLOW BIRCH** — *Betula lutea*
F. A. Michaux

The Yellow birch, also called Gray birch, is a forest tree, ranging from Newfoundland to Manitoba, south to Massachusetts, Pennsylvania, and Wisconsin. It is a very large tree, reaching a maximum height of about 30 meters, with a trunk 1 to 1.5 meters in diameter.

The bark of young and middle-aged trunks is usually silvery gray or yellowish, and is either close and furrowed or peels off freely in very thin layers; on old trunks, especially near their bases, it is rough, reddish brown, fissured, and often 1.5 cm. thick; trees of the same size standing side by side often exhibit the bark either close or peeling, so that the age or size of the trunk is not absolutely correlated with the character of the bark. The young twigs are long-hairy and green, becoming brown or orange-brown, smooth and shining, finally silvery-gray. The pointed buds are about 6 mm. long and somewhat hairy. The leaves are ovate or oblong-ovate, pointed, often long-pointed, sharply simply or doubly toothed, 7 to 12 cm. long, rounded, somewhat narrowed or rarely cordate at the base; they are long-hairy when young, dark green and smooth on the upper surface, paler green and hairy on the lower, at least on the veins, when old; the hairy leaf-stalks are 2 cm. long or less, the pointed ovate stipules about 1 cm. long. The tree flowers in April or May as the leaves unfold. The clustered staminate catkins are 6 to 9 cm. long. The ripe pistillate catkins are oblong, blunt, very short-stalked, or stalkless, their scales 8 to 10 mm. long, longer than wide, hairy and hairy-fringed, about equally 3-lobed to or above the mid-



FIG. 217. — Yellow Birch.

dle, the lateral lobes ascending, the stalk-like part below the lobes linear-wedge-shaped; the nut is oblong, acute at both ends, 3 to 4 mm. long, rather wider than its wings.

The tree grows rapidly and is a striking element in the northern forests, its silvery gray or yellowish bark being quite different from any other. The hard, strong wood is extensively used for furniture, boxes, tools, hubs, and for fuel; it has a specific gravity of about 0.65 and takes a good polish.

V. THE ALDERS

GENUS **ALNUS** [TOURNEFORT] HILL



ABOUT 25 species of Alders are known, distributed nearly throughout the north temperate zone, extending in America south through Central and South America, along the Andes, to Bolivia. The generic name is of Celtic origin, in allusion to the growth of these shrubs and trees along streams, and was adopted later from earlier authors. Other American species than those here described are *A. jorullensis* H. B. K., *A. acuminata* H. B. K., and *A. arguta* H. B. K., and other species in Mexico, *A. acuminata* H. B. K. extending to Peru and Bolivia. *A. ferruginea* H. B. K. occurs in Colombia. We have also several shrubs. The genus is not represented in the West Indies.

The wood of Alders is soft and weak, the sap watery and the bark astringent, being used to some extent for tanning. The leaf-buds are naked, small, usually red, the blades of the leaves being enclosed in their stipules in the bud; the stipules fall away when the leaves unfold. The leaves are variously toothed or lobed, pinnately veined, with the veins usually prominent on the under side. The flowers are very small, monœcious (diœcious bushes of *A. serrulata* Willdenow have been observed), apetalous, densely clustered in catkins, the staminate catkins long and drooping, the pistillate short and erect; the flowers expand either in very early spring before or with the leaves, or in a few species in late summer or autumn, long after the leaves are fully grown. The staminate flowers are borne several together (commonly 3) in the axil of each scale of the catkin; the calyx is usually 4-parted and there are from 1 to 4 stamens with short filaments. The pistillate flowers are 2 or 3 together in the axil of each scale of the catkin; they have no perianth, but are subtended by 2 to 4 minute bractlets; the ovary is sessile and 2-celled, each cell containing one suspended ovule; there are 2 slender styles, which at the time of pollination project beyond the scales of the catkin. The ripe pistillate catkins are oblong to ovoid; they remain on the plant for several months, their scales becoming hard and woody, closely appressed to each other at first, spreading when old and dry, lobed or crenate at the broadened apex. The fruit is a minute nut with sharp margined or winged edges and contains a single seed which has no endosperm.

The European *Betula Alnus* Linnæus is the type of the genus.

Trees or shrubs flowering in early spring.

Nut bordered by a broad membranous wing on each margin.

Nut acutely margined or narrowly winged.

Foliage not glutinous when mature; native species.

Leaves prevailing obovate; eastern shrub or small tree.

Leaves ovate, oval or ovate-lanceolate; seldom obovate.

Leaves mostly brown-pubescent beneath, at least upon the veins;

Pacific coast tree; stamens 4; staminate catkins 1 to 1.5 dm. long.

Leaves green beneath.

Leaves smooth or somewhat hairy beneath; western trees and shrubs.

Leaves obtuse, rounded or cordate at the base, doubly serrate or somewhat lobed; stamens 4; staminate catkins 3 to 6 cm. long.

Leaves mostly narrowed, cuneate or acute at the base, serrate, not lobed; stamens 1 to 3, usually 2.

Leaves ovate to oval, obtuse or acute; Pacific coast tree.

Leaves oblong to oblong-lanceolate, acute or acuminate; southwestern tree.

Leaves densely hairy on the veins beneath; eastern shrub or small tree.

Foliage glutinous; introduced European tree.

Autumn-flowering; eastern tree.

1. *A. fruticosa*.

2. *A. serrulata*.

3. *A. rubra*.

4. *A. tenuifolia*.

5. *A. rhombifolia*.

6. *A. oblongifolia*.

7. *A. noveboracensis*.

8. *A. rotundifolia*.

9. *A. maritima*.



FIG. 218. — Northern Alder.

1. NORTHERN ALDER —

Alnus fruticosa Ruprecht

This tree has long been confused with the shrubby Green alder, *Alnus Alnobetula* (Ehrhart) K. Koch, of northern Europe and northeastern North America, with which it agrees in having the nut bordered by broad membranous wings, but it forms a tree up to 12 meters in height or more, with a trunk at least 2 dm. in diameter.

It occurs in eastern Siberia, Alaska, and the Yukon Territory. The American tree has been separated from the Asiatic one by Professor Sargent under the name *Alnus sitchensis*, but our studies indicate that the two are not specifically different.

The thin bark is gray and nearly smooth outside, red within. The young twigs are slender, glandular, and minutely hairy, becoming brown and shining. The leaves are ovate, rather thin, 6 to 10 cm. long, short-pointed or bluntish, finely and somewhat irregularly toothed but not lobed, bright green, smooth, and with impressed veins on the upper side, paler green and hairy in the axils of the prominent veins beneath; the leaf-stalks are 1 to 2 cm. long. The oblong fruiting catkins are about 1.5 cm. long. The nut is about 2 mm. long, bordered on each side by a thin wing about 1 mm. wide.

Alnus sinuata (Regel) Rydberg, a shrub of the northern Rocky Mountains and the Northwest, has sinuately lobed or incised leaves, which are also more coarsely toothed; it may sometimes form a tree.

2. SMOOTH ALDER — *Alnus serrulata* Willdenow

Betula Alnus rugosa Du Roi. *Alnus rugosa* K. Koch

Usually a shrub not over 6 meters high, forming thickets along water and on moist hillsides, this alder in the South sometimes forms single trunks 13 meters high and 1.5 dm. thick. It ranges from Maine to Florida, Minnesota, Arkansas, and Texas. Trees 8 meters high have been observed on Staten island, New York.

The thin bark is smooth or nearly so, and dark brown. The young twigs are more or less hairy, but soon become smooth and brown. The buds are about 5 mm. long. The leaves are prevailing obovate, but sometimes oval, blunt or rounded at the apex, usually narrowed, though sometimes rounded at the base, sharply and finely toothed, 7 to 13 cm. long and rather thin; when mature they are smooth and dark green on the upper surface, a little lighter green beneath and usually hairy along the veins; the leaf-stalks are 1 to 2.5 cm. in length, and the oval stipules fall away early. The staminate catkins unfold in early spring, before the leaves at the north, with or after the leaves in the south, and are 5 to 10 cm. in length. The ripe pistillate catkins are 1.5 to 2 cm. long; the nut is ovate and sharply margined but not winged.

The wood is soft, close-grained, and light brown; its specific gravity is about 0.47. It is used as fuel and for charcoal. The leaves are glutinous when young.



FIG. 219. — Smooth Alder.

3. OREGON ALDER — *Alnus rubra* Bongard*Alnus oregona* Nuttall

The Oregon alder is a tall forest tree, attaining a maximum height of about 28 meters and a trunk diameter of a meter or more. It inhabits the vicinity of the Pacific coast, extending from California to Alaska, preferring moist soil.

The bark is nearly smooth, light gray or whitish. The young twigs are finely velvety and green, becoming smooth, reddish, and gray. The somewhat hairy buds are 6 to 8 mm. long. The leaves are ovate or oval, pointed or bluntish,

rather firm in texture, prominently straight-veined, usually from 6 to 12 cm. long, but sometimes larger, coarsely toothed with the teeth again dentate; when fully grown they are smooth and dark green on the upper surface, brown-hairy, particularly along the orange-colored veins beneath, but sometimes only slightly so; the leaf-stalks are stout, orange yellow, 1 to 2 cm. long; the small ovate pointed stipules fall early in the season. The catkins of staminate flowers are 1 to 1.5 dm. long at the time of flowering in early spring, before the leaves unfold; the calyx of the staminate flower is 4-lobed and there are 4 stamens with anthers about as long as the filaments. The ripe pistillate catkins are 2.5 cm. long or less, their scales



FIG. 220. — Oregon Alder.

thickened at the apex. The nut is 2.5 mm. long, bordered by a thin wing of only about one third its width.

The wood is weak, brittle, light reddish brown, and takes a good polish; the specific gravity is about 0.48; it is used in large amounts on the Pacific coast for furniture, and in Alaska is made into canoes by the Indians.

4. THIN-LEAVED ALDER — *Alnus tenuifolia* Nuttall

While usually a shrub, this species sometimes becomes a tree 8 to 10 meters high, with a trunk about 2 dm. thick. It occurs along streams and lakes from the Yukon Territory and British Columbia south through the Rocky mountain region to Colorado and New Mexico, and along the Sierra Nevadas to Lower California.

Its thin, reddish brown bark is finely scaly when old. The twigs are at first finely brown-velvety, but soon become smooth and light brown. The buds are red, minutely hairy, and 6 to 8 mm. long. The leaves are ovate or oval, often broadly so, rather thin, pointed or bluntish, coarsely doubly toothed or shallowly

lobed with the lobes toothed, 5 to 10 cm. long, mostly rounded or somewhat heart-shaped at the base; the upper surface is bright green and smooth, the lower light green and either smooth or hairy, at least along the veins, which are quite prominent; the leaf-stalks vary from 1 to 2.5 cm. in length; and the thin ovate stipules, which fall away while the leaves are unfolding, are about 1 cm. long. The catkins of staminate flowers are 2.5 to 4.5 cm. long; each flower has 4 stamens with filaments about as long as the calyx. The ripe pistillate catkins are oblong, 1 to 2 cm. long, their scales thickened and lobed at the top; the round-ovovate nut is about 2.5 mm. long and narrowly winged.



FIG. 221. — Thin-leaved Alder.

5. RHOMBIC-LEAVED ALDER — *Alnus rhombifolia* Nuttall



FIG. 222. — Rhombic-leaved Alder.

This tree is one of the largest North American alders, attaining a height of 25 meters or more and a trunk diameter of about 1 meter; it ranges from Washington and Idaho, through Oregon to San Bernardino county California, occurring most abundantly in river valleys.

The dark brown bark is thick, somewhat fissured and scaly. The young twigs are green and hairy, but early become reddish and smooth, and finally brown. The buds are narrow, hairy, bluntish, and about 1 cm. long. The leaves are mostly oval, sometimes broadly so, sometimes ovate, blunt or pointed, thickish, irregularly finely toothed, usually narrowed or wedge-shaped at the base, 5 to 12 cm. long, the stalk 1 to

2 cm. long; they are hairy on both sides when young, and when mature are rather

dark green and either smooth or quite hairy on the upper side, paler and more or less hairy beneath; the ovate caducous stipules are about 7 mm. long. The tree flowers in December or January; the staminate catkins are then bright yellow and 1.5 dm. long or less, each flower usually having 2 stamens, rarely 1, or 3. The ripe pistillate catkins are oblong, 1.5 to 2 cm. long, their scales a little thickened and somewhat lobed at the apex; the nut is oval, about 2.5 mm. long, narrowly margined.

The weak and brittle wood is of little value; it is light brown with a specific gravity of about 0.40.

6. OBLONG-LEAVED ALDER — *Alnus oblongifolia* Torrey

An inhabitant of cañons, the Oblong-leaved alder is a tree 10 meters high or less, with a trunk 1.5 to 2.5 dm. in thickness; it occurs in Arizona, New Mexico, and northern Mexico. By some authors it has been supposed to be identical with *A. acuminata* H. B. K., of Peru and Bolivia, which extends northward along the Andes, reaching southern Mexico, and has ovate leaves.



FIG. 223. — Oblong-leaved Alder.

The bark of the Oblong-leaved alder is thin and light brown. The young twigs are slightly hairy, but soon become smooth, shining, and red to gray. The buds are pointed, smooth, and 10 to 15 mm. long. The leaves are oblong or oblong-lanceolate, or some of them ovate-oblong, pointed or blunt, rather firm in texture, and 5 to 10 cm. long when fully grown, irregularly sharply toothed, narrowed or wedge-shaped at the base; the upper surface is smooth and rather dark

green, the lower somewhat lighter green and hairy, at least along the veins; the leaf-stalks are hairy, yellow, 1 to 2 cm. long; the small stipules are ovate-lanceolate. The staminate catkins are 9 cm. long or less; the flowers open in December or January; there are usually 2 stamens, considerably longer than the calyx, or sometimes 3. The ripe pistillate catkins are oblong, 1 to 1.5 cm. long, with rather thin scales; the nut is about 2 mm. long and narrowly margined.

7. NEW YORK ALDER — *Alnus noveboracensis* Britton

The New York alder inhabits wet woodlands and thickets near the coast in southeastern New York, and probably occurs also both north and south of that

region; it is a shrub or small tree, when first discovered supposed to be the same as the well-known European *Alnus incana*, but subsequent study has shown it to be quite different from that species; the largest individual tree observed was about 8 meters high, with a trunk 1.5 dm. thick.

The bark is brown, smooth or nearly so, the young twigs slender, densely brownish-hairy, becoming smooth and gray-brown the second season. The leaves are rather thin in texture, oblong to obovate, acute at both ends or bluntish at the apex, 8 to 12 cm. long, 6 cm. wide or less, sharply irregularly toothed, densely hairy on the prominent veins beneath, otherwise smooth or nearly so, dark green on the upper surface, pale green on the lower; the leaf-stalks are about 1 cm. long and very hairy. The fruiting catkins are numerous, oblong, short-stalked, 1.5 cm. long, their scales triangular-wedge-shaped, 3 to 4 mm. long, toothed at the summit, the nut oval, half longer than wide, narrowly margined.



FIG. 224. — New York Alder.

toothed at the summit, the nut oval, half longer than wide, narrowly margined.

8. EUROPEAN ALDER — *Alnus*

rotundifolia Miller

Betula Alnus glutinosa Linnæus

Alnus glutinosa Gærtner

This European tree has escaped from cultivation and become established in New Jersey, southern New York, eastern Massachusetts, and near Chicago; it reaches, in Europe, a height of 25 meters, with a trunk nearly a meter in diameter.

Its bark is dark brown, rather thin, and nearly smooth. The young twigs are loosely hairy, soon becoming smooth. The buds are smooth, glutinous, narrow, blunt, 8 to 10 mm. long. The leaves are broadly oval to orbicular or obovate, thick, dark green, dull, often blunt at both ends, but commonly more or less narrowed at the base, toothed or doubly toothed, glutinous,



FIG. 225. — European Alder.

commonly more or less narrowed at the base, toothed or doubly toothed, glutinous,

at least when young; they are smooth on the upper surface and hairy on the veins on the under side, 5 to 13 cm. long; the leaf-stalks are 1 to 2.5 cm. long; the staminate catkins are 10 cm. long or less, flowering early in the spring before the leaves unfold; the ripe pistillate catkins are ovoid-oblong, 1 to 2 cm. long; the nut is wingless.



FIG. 226. — European Alder, near Egbertville, Staten Island.

The wood is soft and light brown, with a specific gravity of about 0.55, and is used in Europe for woodenware, cooperage, and charcoal. The bark is also used as a tan and dye.

9. SEASIDE ALDER — *Alnus maritima* (Marshall) Muhlenberg

Betula-Alnus maritima Marshall

This interesting tree occurs along ponds and streams, mostly within tidal influence, in Maryland and Delaware, and grows also along the Red River in the Indian Territory; it is curiously absent, so far as is known, in the whole intervening territory. It attains a maximum height of about 10 meters, with a trunk 10 to 13 cm. thick.

The thin, smooth bark is light brown, the young twigs green and hairy, becoming smooth, reddish brown or gray. The buds are pointed and somewhat hairy. The leaves are mostly obovate, varying to oblong, and either blunt or pointed; they are wedge-shaped or narrowed at the base, finely toothed, 5 to 10 cm. long, firm in texture, dark green and shining above, paler, dull, and finely hairy beneath; the yellowish leaf-stalks are 1 to 2 cm. long, the oblong stipules very

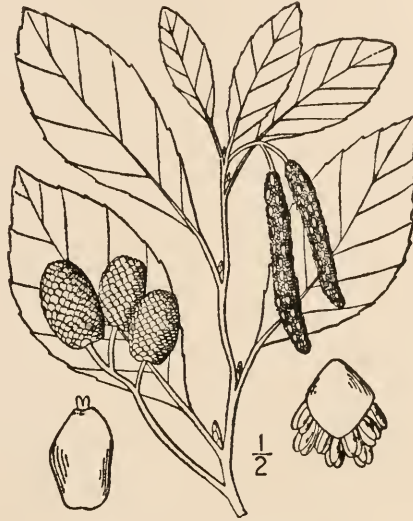


FIG. 227. — Seaside Alder.

small. The staminate catkins are clustered, dense, 6 cm. long or less; their flowers open in August or September. The ripe pistillate catkins are oval to ovoid, 2 cm. long or less, attaining their full growth in July or August of the year following the fertilization of their flowers; their scales are slightly thickened and somewhat lobed at the apex; the nut is obovate, 3 mm. long, margined but not winged.,

The wood is light brown with a specific gravity of 0.50.

THE BEECH FAMILY

FAGACEÆ Drude



THIS family consists of 6 genera including nearly 400 species of trees or shrubs of wide distribution in nearly all regions of the globe. It is of great economic importance as containing, with the exception, perhaps, of the Pine family, the most valuable timber trees. Formerly they were more important than now as a source of food; the European chestnut, however, still holds a prominent place as such in some portions of southern Europe. As a source of tanning material this family is of considerable importance.

The *Fagaceæ* have alternate, pinnately veined, mostly deciduous leaves, with or without stipules. The flowers are small, monœcious, the staminate usually in elongated catkins or in round heads, their perianth 4-lobed or more; stamens 4 to 8, their filaments free, slender, and distinct; anthers adnate, 2-celled, introrse and opening lengthwise. The pistillate flowers are variously disposed, solitary, or several together, sometimes borne at the base of the staminate catkins; they are subtended by an involucre of more or less united, imbricated bracts, which become thickened and partly or entirely enclose the fruit; the perianth is urn-shaped or oblong, 4- to 8-lobed; the ovary, which is joined to the perianth, is 3- to 7-celled, with 1 or 2 ovules in each cell, only one of which matures; the styles are of the same number as there are cells of the ovary, linear, stigmatic on the top or sides. The fruit is a 1-seeded nut with a leathery or bony covering included in or seated on the enlarged scaly or spiny involucre; the seed fills the cavity of the nut, its coat thin and papery, and it has no endosperm; the cotyledons are large and fleshy.

Of the 6 genera, 5 are represented in our arborescent flora; the other one, *Nothofagus*, is confined to the southern hemisphere.

Staminate catkins globose; nut triangular.

1. *Fagus*.

Staminate catkins slender, elongated.

Nut enclosed in a prickly bur.

Fruit maturing the first season; ovary 6-celled; leaves deciduous.

2. *Castanea*.

Fruit not maturing until the second season; ovary 3-celled; leaves persistent.

3. *Castanopsis*.

Nut seated in an open scaly cup.

Staminate catkins erect; pistillate flowers in clusters of 2 to 5.

4. *Parsonsia*.

Staminate catkins drooping; pistillate flowers solitary.

5. *Quercus*.

I. AMERICAN BEECH

GENUS **FAGUS** [TOURNEFORT] LINNÆUSSpecies **Fagus grandifolia** Ehrhart*Fagus ferruginea* Aiton. *Fagus americana* Sweet

MAGNIFICENT tree, inhabiting rich soils, frequently forming almost pure forests, ranging from Nova Scotia to Ontario, Wisconsin, Florida and Texas; its maximum height is about 40 meters, with a trunk diameter of 1.5 m.

The trunks, when crowded in the forest, are tall and slender, but when growing in the open they are short and low-branched, the branches widely spreading, or drooping. The wide-spreading roots grow close to the surface of the ground and produce many young trees, often surrounding the main one with a dense thicket. The bark is about 1 cm. thick, very close, quite smooth, and light gray. The twigs are slender, sometimes zigzag, green and hairy, soon becoming smooth, dark yellow, with lighter yellow lenticels, and pass through various shades of red and brown to gray. The winter buds are often 2.5 cm. long, taper-pointed, and covered with bright brown scales. The leaves are very silky when unfolding, becoming stiff and leathery, ovate, oval or oblong-ovate, 5 to 14 cm. long, usually short taper-pointed, gradually narrowed and wedge-shaped or rounded, or somewhat heart-shaped at the base, sharply toothed on the margin, light green, becoming dull blue-green above, yellowish green, shining and prominently nerved beneath; leaf-stalk grooved and slender, 1.5 to 2 cm. long; stipules thin, reddish, often 2 cm. long, soon falling off. The foliage turns bright yellow before falling in the autumn. The flowers appear when the leaves are partly unfolded, the staminate in globose drooping catkins on hairy stalks 2 to 4 cm. long, with 2 awl-shaped deciduous bracts near the middle; the perianth is somewhat bell-shaped, 4- to 8-lobed, the lobes ovate to oblong, blunt, 3 to 4 mm. long, hairy outside; stamens 8 to 10, their filaments thread-like, nearly twice the length of the perianth; anthers light green. The pistillate flowers are usually 2 together on club-shaped, woolly stalks 12 to 14 mm. long, in the axils of the unfolding upper leaves and surrounded by an involucre of accrescent scales, which are whitish hairy and tinged with red; the hairy perianth is 4- or 5-lobed, the lobes linear-lanceolate, and sharp-pointed. The ovary is inferior, 3-celled; styles 3,



FIG. 228. — American Beech.

strongly reflexed, stigmatic on their inner faces; ovules 2 in each cell. In fruit the involucre is ovoid, 1.5 to 2 cm. long, leathery, brown-hairy with soft spreading or recurved spines, borne on a stout, club-shaped stalk 10 to 20 mm. long. The nut is 1 to 1.5 cm. long, 3-angled and narrowly 3-winged, finely hairy, light brown and shining, ripening in late summer, the kernel sweet and edible. The involucre remains on the tree long after the nut has fallen out.



FIG. 229. — American Beech, Woodlawn, New York.

The wood is hard, strong, tough, very close-grained, dark or light red-brown; its specific gravity is about 0.67. It is used in the manufacture of furniture, plane-stocks and other tools, and for fuel. It is a favorite for smoking meats and is much used in the manufacture of creosote and other chemical products, of destructive distillation. The kernel is sweet and is largely gathered in Canada and sold in the northern cities; southward, however, the tree produces its fruit but sparingly.

The genus contains about 5 species, confined to the northern hemisphere.

The name is the old classic one of the European beech, *Fagus sylvatica*, the type of the genus, which has darker foliage and is frequently planted in our area, especially the very dark-leaved form known as the Copper beech. A very picturesque weeping form is also a great favorite with lovers of beautiful trees. In Europe the fruit is largely used as food for swine, and the sweet, bland, fixed oil expressed from it is used as food. Fossil remains representing species in this genus have been found in Alaska, Colorado, and California.

II. THE CHESTNUTS

GENUS **CASTANEA** [TOURNEFORT] ADANSON



CASTANEA comprises about 5 species of trees or shrubs of the north temperate zone, none, however in western North America; they are noted for their large, sweet nuts.

They have alternate, stiff, membranous, sharp-toothed, straight-veined leaves and caducous stipules. The flowers are strong-scented, appearing after the leaves have fully unfolded. The staminate are in erect or ascending deciduous catkins in the axils of the lower leaves; the flowers are in clusters of 3 to 7, stalked in the axils of small ovate bracts, some of them being subtended by two smaller bractlets; the perianth is bell-shaped, deeply 6-lobed, the lobes ovate and rounded; stamens 10 to 20, their filaments thread-like and white, the anthers ovoid or globose, yellow, long-exserted and introrse. The pistillate flowers are at the base of the upper catkins in clusters of 2 to 5, mostly 3, enclosed in a green, sessile or almost sessile involucre of thick, imbricated, oblong, sharp-pointed, more or less hairy scales; the perianth is urn-shaped, 6-toothed, the staminodes shorter than the teeth; ovary inferior, elongated, imperfectly 6-celled; styles 6, spreading, linear, white, hairy, stigmatic at the apex and projecting much beyond the involucre; ovules 2 in each cell. The fruit ripens in the autumn of the first season, composed of the much enlarged, spiny, 1- to 4-valved involucre, completely enclosing the 1 to 3 nuts, or seldom more, which are leathery coated, ovate, pointed, more or less compressed or flattened when crowded; they have a large basal scar and are tipped with the withered style; seed usually only one, completely filling the cavity, without endosperm; the cotyledons are thick, fleshy, sweet and mealy.

The genus was founded on the Old World chestnut, *Castanea Castanea* (Linnaeus) Karsten, which is cultivated in several improved varieties and its nuts are a very important source of food in some sections of southern Europe and western Asia, where they are dried and ground into meal; they are much larger than the American nut, but less sweet. It is sometimes cultivated in this country. The name is the classic name of the Old World tree and is supposed to be derived from a city of that name in Thessaly. Fossil remains referable to this genus have been found in the Arctic regions of both hemispheres and in western North America.

In addition to the two arborescent species, a low shrub, *Castanea nana* Muhlenberg, also called Chinquapin, occurs in sandy barrens of the Gulf States; it has underground stems, but may not be distinct from *C. pumila*.

Our arborescent species are:

Leaves densely tomentose beneath; small tree or shrub.
Leaves smooth on both sides; large forest tree.

1. *C. pumila*.
2. *C. dentata*.

1. CHINQUAPIN — *Castanea pumila* (Linnæus) Miller

Fagus pumila Linnæus

This small tree, or more often a shrub, of dry, sandy soils, from New Jersey to Indiana and southward to Florida, Missouri and Texas, reaches its greatest development in Arkansas, where it attains a maximum height of about 16 meters, with a trunk diameter of 1 m.



FIG. 230. — Chinquapin.

The trunk is usually short. The branches are slender and spreading, forming a roundish tree. The bark is about 16 mm. thick, somewhat furrowed and broken into loose plates of a light brown color. The twigs are slender, pale woolly at first, soon becoming smoothish, red-brown, and finally darker brown and bearing many small lenticels; buds axillary, ovoid 4 mm. long and covered with scurfy red scales; there are no terminal buds. The leaves are thick and firm, oblong or obovate, sharp-pointed or rounded at the apex, gradually narrowed toward the often unequal, rounded or cuneate base, sharply toothed

on the margin, reddish tinged when unfolding, becoming yellowish green, smooth and shining above, pale, finely hairy, and prominently straight-veined beneath. The leaf-stalk is stout, flattened above, hairy, 6 to 12 mm. long; the yellowish green stipules are smooth and soon fall away. The flowers appear in May or June, the staminate catkins more or less spreading, 10 to 20 cm. long, with a stout hairy axis; the upper catkins are from 5 to 15 cm. long, bearing the pistillate flowers at the base, which are usually scattered, sometimes crowded; the involucre is sessile or nearly so, one-flowered, seldom 2-flowered, glandular and whitish hairy. The fruit ripens from August to October, is subglobose, 3 to 4 cm. in diameter, densely covered with stiff spines and usually containing only one nut, seldom 2; the inner surface of the bur is softly silky; the nut is ovoid to ovoid-cylindric, rounded at the base, tapering to the sharp-pointed more or less hairy apex, bright brown and shining, 1 to 2 cm. long, thin-shelled; the seed is very

The wood is hard, strong, coarse-grained, and brown; its specific gravity is

about 0.59. It is very durable in the soil and is esteemed for fence-posts and railroad ties. The fruit is collected and sold in the markets of the south and west, but seldom reaches those of the northeast. It is a beautiful small tree and deserves more frequent planting in parks.

A remarkable specimen from Eagle Rock, Missouri has large leaves as coarsely toothed as those of the Chestnut.

2. CHESTNUT — *Castanea dentata* (Marshall) Boreckhausen

Fagus Castanea dentata Marshall. *Castanea vesca americana* Michaux

This stately tree is frequent throughout eastern North America from Maine to Ontario and Michigan, southward to Delaware and thence along the mountains to northern Alabama and Mississippi, and to Indiana and Arkansas. It is tall and slender in the forests, but broad and spreading, with somewhat drooping branches, forming a round top often 30 meters across when growing in the open. Its maximum height is about 30 meters, with a trunk diameter of 4 meters.

The bark is from 2.5 to 5 cm. thick, deeply and narrowly furrowed into nearly flat somewhat oblique ridges and divided into small, irregular, close scales of a dark brown color. The twigs are slender, round, slightly hairy, becoming smooth, and change through various shades of yellow and reddish to dark brown. There is no terminal bud; the winter buds are all lateral, ovoid, sharp-pointed, 6 mm. long, their thin scales bright brown. The leaves are thin, narrowly elliptic, elliptic-lanceolate or oblong-lanceolate, 1 to 3 dm. long, taper-pointed, gradually narrowed to the wedge-shaped base, coarsely and sharply toothed on the margin, smooth on both sides, dull yellowish green and shining above, paler and prominently veined beneath; the leaf-stalk is yellow, stout and angular, 1 to 2 cm. long; the stipules ovate-lanceolate, 12 mm. long, soon falling off. In autumn the foliage turns bright yellow. The flowers appear in June or July after the leaves are quite fully expanded; they are strong scented, in numerous upright or spreading catkins, the staminate 1.5 to 3 dm. long, the flower-clusters crowded on a stout, green axis. The upper catkins are slender, 5 to 12 cm. long; their upper staminate flowers are smaller than those of the lower catkins and soon fall away from the persistent axis, toward the base of which are borne the 2 or 3 stalked globular involucre, 8 mm. in diameter, armed with crowded stiff spines, and enclosing 2 or 3 pistillate flowers. The fruit ripens in September and October;



FIG. 231. — Chestnut.

the burs are yellowish green, globular, 5 to 7 cm. in diameter and very densely covered with numerous stiff spines; internally they are coated with soft, silky, brownish hairs and enclose 2 or 3, rarely 5 nuts, or only 1; the nuts are ovoid, 2 to 2.5 cm. long, usually flattened on one side, bright brown, broadly scarred at the base and finely hairy at the apex; seed sweet and delicious. The burs open spontaneously on the tree after several severe frosts, when the nuts are shaken out by the lightest breeze; they are largely gathered from native trees in the mountainous districts and shipped to the cities, where they are eagerly consumed, usually after roasting. The nuts vary greatly in size and quality on different trees.

The wood is soft, weak, very coarse-grained, yellowish brown; its specific gravity is about 0.45. It is very durable in the soil, splits easily, and is much used for fencing and for building. It is also rich in tannic acid and has been used in tannery. The leaves are an imaginary specific for whooping cough.

Its rapid growth and fine form make of it a very desirable tree, while its valuable fruit should obtain for it more scientific cultivation. It is unfortunately subject to a destructive fungus disease, which rapidly kills branches and young trees, pursuing its ravages under the bark.

A tree on which the involucre and burs are suppressed grows in Greene county, New York, where it is widely known as the Burless chestnut. A tree in the New York Botanical Garden has many of the flowers transformed into small leaves.

III. GOLDEN-LEAF CHINQUAPIN

GENUS **CASTANOPSIS** [D. DON] SPACH

Species ***Castanopsis chrysophylla*** (Hooker) A. de Candolle

Castanea chrysophylla Hooker



ALSO called Golden-leaved chestnut, this is a beautiful evergreen tree of the Pacific slope from the Columbia River southward to the San Jacinto Mountains; in the coastal valleys of northern California it attains a height of 45 meters, with a trunk diameter of 3 m.

The trunk is straight and often fluted, often without branches for half its length. The branches are short and spreading, forming a compact round or conic tree. The bark is about 4 cm. thick, deeply fissured into blunt, broad ridges which are covered with rather thick dark red-brown scales; internally it is bright red. The twigs are slender, stiff, bright yellow and scurfy, finally becoming nearly smooth, dark red-brown and bearing small lenticels and scars of the bud-scales. The buds are 6 mm. long, usually crowded near the ends of the twigs, ovoid to nearly globular, covered by many broad brown scales. The leaves are thick and leathery, 5 to 15 cm. long, lanceolate or oblong, gradually taper-pointed, wedge-shaped at the base, entire, somewhat thickened and revolute on the margin, thin and hairy when unfolding, becoming dark green, smooth and shining, golden-

hairy beneath; the stout leaf-stalk is grooved, and from 5 to 10 mm. long. The leaves turn yellow at the end of their second year, and gradually fall off; the stipules are brown and fall very early. The flowers are monœcious, appearing during the summer, a few continuing to unfold for several months afterward. The staminate are in erect or spreading elongated catkins with a stout scurfy axis, about 7 cm. long, clustered at the ends of the branchlets and composed of 3-flowered clusters in the axils of ovate sharp-pointed scales; the perianth is bell-shaped, deeply 5-lobed or 6-lobed; stamens 10 to 12, their filaments thread-like, elongated; anthers oblong, 2-celled, opening lengthwise; ovary rudimentary and



FIG. 232. — Golden-leaf Chinquapin.

hairy. The pistillate flowers are in clusters of 2 or 3, or solitary, at the base of some of the lower catkins, enclosed in an involucre of scales; the globose-oblong perianth is 6-lobed; abortive stamens as many as the perianth lobes and opposite them; ovary inferior, sessile, conic, hairy; stigmas slightly spreading. The fruit, ripening in the autumn of the second season, is globose, 2.5 to 4 cm. in diameter, sessile, solitary or clustered, covered by long, slender, stiff, sharp spines, dehiscent into 4 irregular valves, coated with long hairs on the inside and containing 1 nut or sometimes 2, the nuts ovoid, bluntly 3-angled, with a large basal scar, pale hairy near the apex, otherwise brown and shining; the shell is thick with a thin papery inner coat; the seed fills the cavity, and is sweet and edible.

The wood is soft, close-grained, weak, light reddish brown; its specific gravity is about 0.56. On account of its lack of strength it is seldom used except for fuel.

The bark is very rich in tannin and is one of the principal tan barks of the Pacific States.

The genus contains about 25 species, mostly natives of southeastern Asia and the Malay region. *Castanopsis sempervirens* (Kellogg) Dudley, a shrub of higher altitudes in California and Nevada, was long confused with this tree, which often assumes shrubby forms. The generic name is Greek, in allusion to the resemblance to the Chestnut, the type species being *C. armata* (D. Don) Spach, of Asia.

IV. TAN BARK OAK

GENUS **PASANIA** [MIQUEL] ÖRSTED

Species ***Pasania densiflora*** (Hooker and Arnott) Örsted

Quercus densiflora Hooker and Arnott



LSO called Chestnut oak, this is one of the most stately broad-leaved trees of the Pacific States and occurs from southern Oregon southward along the Coast mountains to Santa Barbara county, California, attaining in its greatest dimensions a height of 30 meters, with a trunk diameter of 1.8 m. Its leaves are evergreen.

The trunk is tall and straight with a narrow head when growing in the forest; in the open it is shorter and much branched, the outspreading branches forming a broad round-topped tree. The bark is 2 to 3.5 cm. thick, deeply and narrowly fissured into broad ridges, which are much broken into angular scaly plates of a bright reddish brown color. The twigs are short, yellowish hairy the first season, becoming smooth, glaucous, and dark red-brown; the buds are ovoid, 6 to 8 mm. long, sharp-pointed, and covered by woolly, ovate scales and surrounded by awl-shaped stipules. The leaves, which persist for 3 or 4 years, are leathery, oblong or oblong-obovate, 7 to 12 cm. long, blunt or sharp-pointed, rounded, tapering, or often somewhat heart-shaped at the base, sharply toothed, revolute on the margin, densely yellow hairy and glandular at first, becoming pale green, smooth and shining, but often remaining more or less rusty hairy for some time and with prominent



FIG. 233. — Tan Bark Oak.

midrib above, pale or nearly white, nearly smooth and conspicuously veined beneath. The leaf-stalk is short, stiff and hairy, about 1.5 cm. long; stipules various, oblong to linear-lanceolate, caducous or the late ones persistent for several

months. The flowers appear during the spring and sometimes sparingly during the rest of the year, in the axils of leaves of the season or of the previous year, in erect, hairy catkins 7 to 10 cm. long; the staminate catkins consist of crowded, 3-flowered clusters, with ovate hairy bracts, the hairy perianth has 5 sharp, triangular lobes; stamens 10, their filaments elongated and slender; anthers small, notched; the abortive ovary is small and hairy. The pistillate flowers are borne near the base of the upper catkins, solitary in the axils of sharp, hairy bracts; the perianth is 6-lobed, hairy; ovary ovoid, hairy, incompletely 3-celled; styles 3, elongated and slightly spreading, light green; there is a staminode at the base of each lobe of the perianth with a slender red exerted filament and an abortive anther. The fruit ripens during the second season, borne on stout hairy peduncles 12 to 18 mm. long, solitary or two together; the nut is ovoid, sharp-pointed, 1.5 to 3 cm. long, 1.5 to 2.5 cm. in diameter, scurfy when young, smooth and brown when ripe; shell hard, hairy within, enclosing the thick, red-brown seed; cotyledons light yellow and bitter; involucre saucer-shaped, shallow, brown hairy within, bearing many linear, spreading or recurved light brown hairy scales, the fruit much resembling that of the eastern Bur oak.

The wood is hard, strong, close-grained, brittle, light reddish brown; its specific gravity is about 0.68. It is little used except as fuel, for which it is highly valued. The bark is rich in tannin and preferred to all other Pacific slope oaks. The tree sprouts readily from stumps and thus renews itself like the Chestnut tree of the eastern States. It is of much interest as combining many of the characters of both chestnuts and oaks.

Pasania consists of about 100 species of trees and shrubs, mostly of the Malay region and southern Asia. A shrubby species, with smaller entire leaves, occurs in the higher mountainous regions of California adjacent to the range of the Tan bark oak, with which it was formerly confused. The generic name is adapted from the Javanese name for one of the species, the type being *P. spicata* (Smith) Örsted.

V. THE OAKS

GENUS *QUERCUS* [TOURNEFORT] LINNÆUS



QUERCUS comprises about 250 species of trees or shrubs of the northern hemisphere, reaching to or somewhat beyond the equator in the high mountains of Central and South America, its center of distribution being the mountains of Central America and Mexico; there are very few species in Europe. Numerous fossil forms of the genus have been found in both hemispheres.

Economically these trees are of great value as furnishing some of the most important and most generally used hard wood timber. The barks of many are rich in tannin and of great importance in tanning, as are also the galls caused

by insect punctures on some species, the best containing from 60 to 70 per cent. of tannic acid. These galls and some of the barks are valued as astringents in medicine. The thick corky bark, especially of *Q. Suber* Linnæus, and of *Q. occidentalis* J. Gay, both natives of southern Europe, is valued as the material from which corks and many other useful articles are manufactured. The nuts of many species have been used from time to time as food for man and are still so used in some districts, especially in the mountains of Mexico; roasted they also form a substitute for coffee. The Old World species, *Q. Robur* Linnæus, in its several forms, is extensively used in Europe as an ornamental shade tree, and is planted to some extent in this country.

They have alternate, simple, deciduous or persistent leaves, which are pinnately lobed, variously toothed or entire, often bristle-tipped. The stipules usually fall off early. The flowers are monœcious, the staminate numerous, usually in clustered slender drooping catkins, their calyx bell-shaped, 4- to 7-lobed, subtended by caducous bracts; stamens 6 to 12, usually exserted; filaments thread-like; anthers usually oblong and smooth, sometimes hairy; rarely there is a rudimentary ovary. The pistillate flowers are solitary or in small clusters; calyx urn-shaped, joined to the usually 3-celled ovary and subtended by a many-bracted involucre; ovules 2 in each cavity, usually only one maturing; styles usually 3, stigmatic tipped. The fruit, called acorn, consists of an indehiscent, 1-celled, usually 1-seeded, leathery, ovoid, oblong or subglobose nut, more or less embraced by a cup consisting of the enlarged involucre of imbricated and somewhat enlarged bracts; cotyledons half round, occasionally united. The fruits of many of the species require two years to mature.

The name is the old classic name of the oak, probably of Celtic origin and signifying beautiful tree, the type species being the European *Quercus Robur* Linnæus.

In addition to the arborescent species, there are a considerable number of shrubs, especially in the region of the Rocky Mountains and beyond.

A. Leaves or their lobes mostly bristle-tipped; styles elongated; shell of nut mostly pubescent inside.

a. Fruit maturing the second season.

* Leaves deciduous.

† Leaves pinnatifid or pinnately lobed, or, if entire, obovate or spatulate.

§ Leaves pinnatifid or pinnately lobed, usually deeply so.

° Leaves green on both sides.

Cup saucer-shaped, much broader than high.

Cup 16 to 30 mm. broad; leaves dull, not shining.

1. *Q. rubra*.

Cup 8 to 16 mm. broad; leaves shining above.

Nut little, if at all, longer than thick.

Petioles 2 cm. long or more; leaves 5- to 9-lobed.

2. *Q. palustris*.

Petioles less than 2 cm. long; leaves 3- to 5-lobed.

3. *Q. georgiana*.

Nut ovoid, considerably longer than thick.

4. *Q. Schneekii*.

Cup top-shaped to hemispheric or deeper.

- Inner scales of cup inflexed; southern tree. 5. *Q. Catesbaei*.
- Inner scales of cup not inflexed.
- Inner bark of tree bright orange; leaves mostly hairy, at least on the veins. 6. *Q. velutina*.
- Inner bark gray to reddish or yellow; leaves green beneath.
- Leaves dull, not shining, paler beneath; northern tree. 7. *Q. borealis*.
- Leaves shining above.
- Cup 10 to 15 mm. broad.
- Cup top-shaped; nut ellipsoid to subglobose; northern tree. 8. *Q. ellipsoidalis*.
- Cup hemispheric; nut oblong; Texan tree. 9. *Q. texana*.
- Cup 15 to 25 mm. broad.
- Cup much wider than high; eastern tree. 10. *Q. coccinea*.
- Cup about as wide as high; western tree. 11. *Q. Kelloggii*.
- °° Leaves white-tomentulose or gray-tomentulose beneath; eastern trees.
- Large trees; leaf-lobes mostly long, lanceolate.
- Leaves rounded or obtuse at base, 3- to 7-lobed. 12. *Q. triloba*.
- Leaves cuneate, acute or truncate at the base; 5- to 13-lobed. 13. *Q. pagodaefolia*.
- Small tree or shrub; leaf-lobes triangular, short. 14. *Q. ilicifolia*.
- §§ Leaves 3- to 5-lobed above the middle or entire, obovate or spatulate in outline.
- Cup hemispheric; leaves obovate, brown hairy beneath. 15. *Q. marylandica*.
- Cup saucer-shaped; leaves spatulate to obovate, smooth.
- Cup shallow; nut over 10 mm. long; leaves thick. 16. *Q. nigra*.
- Cup deep; nut less than 10 mm. long; leaves thin. 17. *Q. microcarya*.
- †† Leaves entire or rarely with a few teeth toward the apex, linear to elliptic or oblanceolate; Willow oaks.
- Leaves smooth beneath.
- Cup very flat.
- Leaves sharp-pointed, linear-oblong to narrowly elliptic. 18. *Q. Phellos*.
- Leaves blunt, oblong to cuneate-oblong. 19. *Q. hybrida*.
- Cup with a narrow base, saucer-shaped; leaves shining above. 20. *Q. laurifolia*.
- Leaves hairy beneath.
- Leaves brown hairy beneath; cup mostly hemispheric. 21. *Q. imbricaria*.
- Leaves gray-hairy beneath; cup saucer-shaped. 22. *Q. cinerea*.
- ** Leaves persistent.
- Leaves densely white downy beneath; southwestern tree. 23. *Q. hypoleuca*.
- Leaves green beneath, smooth when mature.
- Nut long, narrowly ovoid; cup deep; California tree. 24. *Q. Wislizeni*.
- Nut short, ovoid; cup shallow; southeastern tree. 25. *Q. myrtifolia*.
- b. Fruit maturing the first season; leaves persistent; leaves oval to orbicular, convex; California tree. 26. *Q. agrifolia*.
- B. Leaves lobed or entire, rarely bristle tipped; styles very short or none; shell of nut mostly smooth inside; White oaks.
- a. Fruit maturing the second season; leaves persistent.

- Nut small, smooth inside, leaves abruptly short-acuminate; southwestern tree. 27. *Q. Wilcoxii*.
- Nut large, silky inside; leaves acuminate to obtuse; California trees. 28. *Q. chrysolepis*.
- Leaves pale and smooth beneath, at least when old; cup thick. 29. *Q. tomentella*.
- Leaves stellate hairy, at least on the veins beneath; cup thin.
- b. Fruit maturing the first season.
- *Leaves persistent, mostly evergreen.
- Southeastern trees.
- Leaves not reticulate-veined. 30. *Q. virginiana*.
- Leaves reticulate-veined. 31. *Q. geminata*.
- Western and southwestern trees.
- Leaves coarsely reticulate-veined and hairy beneath.
- Leaves oblong to oblong-obovate, acute; cup hemispheric. 32. *Q. arizonica*.
- Leaves obovate, mostly blunt; cup saucer-shaped. 33. *Q. reticulata*.
- Leaves not coarsely reticulate-veined beneath, sometimes finely reticulated.
- Leaves dark green above.
- Leaves spinulose-toothed to entire, cordate or rounded at base; Texas to Arizona. 34. *Q. Emoryi*.
- Leaves not spinulose, but sinuate-lobed, rarely entire, narrowed at base; Texan tree. 35. *Q. breviloba*.
- Leaves light green or blue-green.
- Cup-scales, at least the lower, corky-thickened on the back.
- Leaves sinuately 5- to 7-lobed; Arizona tree. 36. *Q. pauciloba*.
- Leaves entire, wavy or toothed.
- Leaves hairy beneath even when old. 37. *Q. undulata*.
- Leaves smooth beneath when old.
- Nut 10 to 15 mm. long; Texas to Arizona. 38. *Q. oblongifolia*.
- Nut 18 to 25 mm. long; southern California. 39. *Q. Engelmanni*.
- Cup-scales thin, scarcely thickened on the back; Arizona tree. 40. *Q. Toumeyii*.
- **Leaves deciduous.
- Leaves blue-green; California tree. 41. *Q. Douglasii*.
- Leaves yellow-green to dark green.
- †Leaves entire, wavy or lobed only near the apex.
- Cup saucer-shaped.
- Leaves hairy beneath; cup thin. 42. *Q. Durandii*.
- Leaves smooth; cup thick. 43. *Q. Laceyi*.
- Cup hemispheric.
- Leaves coarsely lobed toward the apex, smooth when mature. 44. *Q. austrina*.
- Leaves irregularly lobed or angulate, persistently pubescent beneath. 45. *Q. Chapmani*.
- ††Leaves coarsely toothed or lobed nearly all around.
- Leaves crenate or shallowly lobed; Chestnut oaks; eastern trees.
- Acorns sessile or nearly so.
- Low tree or usually a shrub; leaves obovate. 46. *Q. prinoides*.
- Tall trees.
- Leaves oblong to lanceolate or some of them obovate; bark close. 47. *Q. Muhlenbergii*.

- Leaves obovate; bark flaky.
 - Acorns manifestly stalked (short-stalked in no. 50).
 - Peduncles shorter than the petioles or about as long.
 - Bark close, deeply furrowed; leaves gray tomentose beneath.
 - Bark flaky.
 - Leaves smooth; Texan tree.
 - Leaves densely hairy beneath.
 - Peduncles much longer than the petioles.
 - Leaves deeply lobed.
 - Leaves hairy, at least on the veins beneath, even when old.
 - Upper scales of the cup awned, forming a fringe around the rim of cup.
 - Upper scales of the cup not awned.
 - Acorn mostly broader than high; nut mostly immersed in the cup; leaves lyrate, usually white-tomentulose beneath.
 - Acorn longer than broad; nut not more than half immersed in cup.
 - Western trees.
 - Large trees of the Pacific states.
 - Nut conic and acute; cup-scales thickened.
 - Mainland tree; leaves deeply lobed; cup shallow.
 - Island tree; leaves not deeply lobed; cup deep.
 - Nut ovoid or obovoid-oblong; cup-scales thin.
 - Small trees or shrubs of the Rocky mountain region.
 - Mature leaves velvety beneath.
 - Cup-scales thin.
 - Cup-scales corky-thickened.
 - Mature leaves not velvety beneath, thin.
 - Eastern trees.
 - Leaves with rounded upper lobes; cup 11 to 14 mm. broad; southern tree or shrub.
 - Leaves with truncate or emarginate upper lobes; cup 15 to 20 mm. broad; eastern tree.
 - Leaves smooth and pale beneath when old; cup shallow.
- 48. *Q. Alexanderi*.
 - 49. *Q. Prinus*.
 - 50. *Q. Brayi*.
 - 51. *Q. Michauxii*.
 - 52. *Q. bicolor*.
 - 53. *Q. macrocarpa*.
 - 54. *Q. lyrata*.
 - 55. *Q. lobata*.
 - 56. *Q. MacDonaldi*.
 - 57. *Q. Garryana*.
 - 58. *Q. submollis*.
 - 59. *Q. utahensis*.
 - 60. *Q. leptophylla*.
 - 61. *Q. Margareta*.
 - 62. *Q. stellata*.
 - 63. *Q. alba*.

1. RED OAK — *Quercus rubra* Linnæus

This well-known tree extends from Nova Scotia to Minnesota and Kansas, southward to Florida and Kansas, reaching its greatest development in the region between the Great Lakes and the Ohio River. Its maximum height is 50 meters, with a trunk diameter of 1.5 m. It is also called Yellow oak, Black oak, Leopard oak, and Spanish oak.

The branches are stout and somewhat spreading, forming a narrow, round-topped head, or in the open they are widely spreading and form a broad, round

tree. The bark is up to 4 cm. thick, shallowly furrowed into low rounded



FIG. 234. — Red Oak.

ridges slightly broken into close plates, dark reddish brown; on younger trunks and on branches it is smooth and gray to brown. The twigs are slender, light green and shining, becoming dark green or reddish, and finally dark brown. The winter buds are ovoid, 6 mm. long, narrowed upward to a sharp point and light brown. The leaves are oval, ovate or obovate in outline, 10 to 20 cm. long, the 5 to 7 lobes ascending, entire or with a few bristle-tipped teeth, their sinuses rounded and extending about half-way to the midrib, base wedge-shaped or obtuse. They are thin but firm, dull green, little shining, with prominent yellow, or often red midrib above, pale and smooth, except for tufts of hairs in the axils of the veins, and with a yellow midrib beneath, turning dull yellow or light brown and fall off early in autumn. The leaf-stalk is 3 to 5

cm. long, usually red or yellow. The flowers appear when the leaves are about half unfolded, the staminate in clustered slender hairy catkins about 1 dm. long, scattered on short pedicels; the calyx is deeply lobed, with 4 or 5 rounded lobes; the stamens 4 or 5, exserted, their anthers large, oblong, notched, and smooth. The pistillate flowers are few together on short smooth stalks; involucre-scales ovate, mostly blunt, reddish brown; floral bracts longer than the scales of the involucre; calyx-lobes lanceolate, sharp-pointed; styles 3, spreading, light green. The fruit ripens in the autumn of the second season, one or two together, on stalks about 6 mm. long; its nut is ovoid, 2.5 to 3 cm. long, flat at the base, tipped at apex, the interior of the shell velvety; cup flat, saucer-shaped, 2.5 to 3.5 cm. across, hairy within, light reddish brown outside, embracing about one fifth of the nut, the scales closely imbricated, slightly hairy.

The wood is hard, strong, coarse-grained, light reddish brown; its specific gravity is about 0.66. It checks much in drying and is used in construction work, for furniture, and in general carpentry.

A handsome tree and greatly admired in Europe. It is a rapid grower and deserves to be more widely planted for shade than it has been.

Quercus rubra runcinata A. de Candolle, from near St. Louis, Missouri, is supposed to be a hybrid of this and the Spanish oak, *Q. triloba* Michaux; it possesses features of both. Another supposed hybrid, also from Missouri, may be a cross with the Shingle oak, *Q. imbricaria* Michaux, as it possesses characters found in both species.

2. PIN OAK — *Quercus palustris* Du Roi

This handsome tree occurs in wet river-bottom lands or on the borders of swamps in rich soil from Massachusetts to Michigan and Missouri, southward to Virginia, Tennessee, and Indian Territory. Its maximum height is about 40 meters, with a trunk diameter of 1.5 m. It is also called Swamp spanish oak, Water oak, and Water spanish oak.

The trunk is tall and straight, its lower branches small, tough, and drooping, the others are mostly spreading and longer, forming, when not crowded, a symmetrical conic tree, which in old age becomes more round and irregular. The bark is about 2.5 cm. thick, nearly smooth or covered with small close scales of a dark gray color; on the branches it is smoother, light brown and shining, or often reddish. The twigs are slender, at first dark red and short whitish hairy, soon becoming smooth, green and shining, finally dark grayish brown.

The winter buds are ovoid, 3 mm. long, sharp pointed, their scales light brown. The leaves are broadly oval to ovate or oblong in outline, 6 to 15 cm. long, their 5 to 9 lobes oblong, lanceolate or triangular, usually with long bristle-tipped teeth, the sinuses usually wide, deep, and rounded, the base wedge-shaped or broadly tapering; they are thin and firm, dark green and shining above, pale and smooth except for tufts of hairs in the axils of the prominent venation beneath, turning a beautiful scarlet in the autumn before falling. The leaf-stalk is 2 to 5 cm. long, slender, nearly round, and yellow. The flowers appear in May when the leaves are about one third unfolded; the staminate in slender, hairy catkins, 3 to 5 cm. long; the calyx is minutely hairy, its 4 or 5 lobes oblong, obtuse; stamens 4 or 5, exserted, their anthers oblong, slightly notched, smooth and yellow. The pistillate flowers are on short, hairy peduncles, their involucre scales ovate, woolly; styles spreading or recurved, and light red. The fruit, ripening in the autumn of the second year, is sessile or very short-stalked, solitary or in clusters; nut hemispheric when young, becoming subglobose, 10 to 15 mm. long, light brown, often striped; shell thin, pale and brownish velvety inside; cup saucer-shaped, 12 to 15 mm. across, embracing very little of the nut, dark reddish brown and hairy on inner surface, light reddish brown and shining on outer surface, the scales with rounded apex and dark margins.

The wood is hard, strong, coarse-grained, and light brown; its specific gravity is about 0.69. It checks and warps badly; it is used in construction work and for shingles.



FIG. 235. — Pin Oak.

The Pin oak grows rapidly, is easily transplanted, and is one of the most desirable oaks for shade on streets or in parks. An interesting form of this tree with narrowly obovate leaves occurs on the Palisades of New Jersey.



FIG. 236.—Pin Oaks, New York Botanical Garden.

3. GEORGIA OAK — *Quercus georgiana* M. A. Curtis

A small tree, but more often a bushy shrub, of very local occurrence, being known only from Stone Mountain and a few similar granite uplifts in the same section of the state for which it is named. Its maximum height is 9 meters, with a trunk diameter of 3 dm.

The bark is rough, thin, covered with small, light brown scales. The twigs are slender, smooth, and dark green, becoming reddish and finally dark brown or gray.

The winter buds are ovoid, sharp or blunt-pointed, about 3 mm. long. The leaves are obovate or oblong in outline, 8 to 10 cm. long, the 3 to 5, rarely 7, lobes are triangular or ovate and bristle pointed; their sinuses are oblique, wide or narrow, extending about half-way to the midrib; the base is gradually wedge-shaped. They are thin, bright green and shining, with a slender rounded yellow midrib above, paler,



FIG. 237. — Georgia Oak.

somewhat shining, smooth or with a few hairs at the axils of the principal veins beneath, turning dull orange or scarlet in autumn; the leaf-stalk is slender, grooved, somewhat hairy, and scarcely 2 cm. long. The flowers appear in April, when the leaves are about one half unfolded, the staminate in clustered slender, few-flowered catkins 5 to 7.5 cm. long; their hairy calyx has 4 or 5 ovate, rounded lobes; stamens 4 or 5, somewhat exserted; anthers oblong, slightly notched, smooth and yellow. The pistillate flowers are on short, slender, smooth stalks, their involucral scales ovate; calyx-lobes sharp-pointed and slightly hairy; styles elongated, red. The fruit, ripening in the autumn of the second year, is borne on stout stalks about 5 mm. long, solitary or in clusters of 2 or 3; nut ovoid to nearly globose, 10 to 14 mm. long, reddish brown and shining; cup thin, saucer-shaped, 15 mm. wide or less, embracing very little of the base of the nut, its scales blunt and irregularly toothed.

Uncommon in cultivation, but hardy as far north as Massachusetts.

A supposed hybrid occurs on Stone Mountain, which is thought to be a cross with *Quercus marylandica*.

4. SCHNECK'S OAK — *Quercus Schneckii* Britton*Quercus texana* Sargent, not Buckley

This large tree, greatly resembling the Pin oak in general appearance, occurs from North Carolina to Illinois, Iowa and southward to Florida and Texas. Its maximum height is 65 meters, with a trunk diameter of 2.5 m.

The trunk is much buttressed, tall and straight. The branches are tough, pendulous below, spreading above, the tree usually round-topped. The bark is sparsely furrowed into broad ridges of a reddish brown color, or on younger stems smooth and gray. The twigs are stout and brittle, hairy at first, soon becoming smooth, light green, orange or reddish brown, and finally brown or gray. The winter buds are ovoid or oblong, about 4 mm. long, pointed or rounded at the apex. The leaves are ovate to obovate in outline, 6 to 20 cm. long, the 5 to 9 lobes oblong to triangular, spreading or ascending, bristle-tipped, sometimes toothed, their sinuses usually wide and rounded, extended about half-way to the midrib or more; they are tapering at the base, thin, bright dark green and shining above, paler and smooth, except for tufts of hairs at the axils of the principal veins, beneath. The leaf-stalk is slender, 2

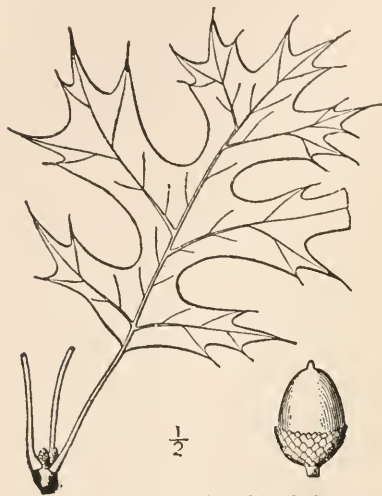


FIG. 238. — Schneck's Oak.

to 5 cm. long. The flowers appear in the spring, the pistillate ones having rather short, spreading, light red styles. The short-stalked fruit ripens in the autumn of the second season; nut ovoid, 1.5 to 2.5 cm. long, reddish brown, sometimes striped with darker lines; cup embracing about one third of the nut, deeply saucer-shaped, its scales light brown, blunt and woolly.

The wood is similar to that of the eastern Red oak and is used as such, being considered by lumbermen as of better grade and more durable.

5. TURKEY OAK — *Quercus Catesbæi* Michaux

A small tree of dry sandy portions of the coastal plain from North Carolina to Florida and eastern Louisiana; its maximum height is 20 meters, with a trunk diameter of 1 m.

The branches are mostly rather stout, spreading, forming an irregular narrow or more or less rounded tree. The bark is up to 2.5 cm. thick, deeply fissured into irregular ridges and broken into small thick close plates, with a reddish interior, dark brown to nearly black externally. The twigs are stout, densely woolly at first, soon becoming smooth and passing through various shades of red to brown. The buds are ovoid, 12 mm. long, sharp-pointed and covered by light brown ap-

pressed-hairy scales. The leaves are obovate to ovate in outline, 8 to 20 cm. long; the 3 to 5 lobes are oblong, ovate or narrowly lanceolate, bristle-tipped, sometimes coarsely toothed, the sinuses rounded and deep, the base wedge-shaped. They are thick and stiff, yellowish green and shining, with a broad, raised midrib above, paler, shining and smooth, except for the tufts of hairs in the axils of the principal veins beneath, turning brown or dull yellow before falling in the autumn; leaf-stalk stout, flattened and grooved, 0.5 to 1 cm. long. The flowers appear in March or April with the leaves, the staminate in clustered slender hairy, simple or branched catkins 10 to 12.5 cm. long; calyx with 4 or 5 sharp lobes; anthers



FIG. 239. — Turkey Oak.

oblong, pointed, and yellow. The pistillate flowers are on short, hairy stalks, their involucral scales bright red and hairy, their styles elongated and dark red. The fruit ripens in the autumn of the second year, usually solitary on a stout stalk about 6 mm. long; nut ovoid to oblong, 2 to 2.5 cm. long, dull, white-woolly at the apex; cup top-shaped, 1.5 to 2 cm. across, thin, light reddish brown, slightly hairy on inner surface, embracing about one third of the nut, its upper scales thin, ovate to oblong, blunt, hairy, inflexed over the edge of cup so as to form a rim or border about 3 mm. wide.

The wood is hard, strong, rather coarse-grained, light reddish brown; its specific gravity is about 0.73. It is extensively used for fuel but not known to be used for other purposes.

This tree is valuable on account of its rapid growth in the sterile soils in which

it thrives, thus quickly yielding a supply of fuel. It is supposed to hybridize readily, as trees have been found in Lee county, Florida, that are considered crosses of this species with the High ground willow oak, *Quercus cinerea* Michaux, and the oak from Bluffton, South Carolina, described under the name of *Q. sinuata* (Lambert) Walter, is now considered a cross with the Laurel oak, *Q. laurifolia* Michaux.

This tree is also known as the Scrub oak, Black jack, Barrenscrub oak, Forked leaf oak, and Forked leaf jack oak.

6. BLACK OAK — *Quercus velutina* Lamarek

Quercus tinctoria Michaux

A tree of dry uplands from Maine to western Ontario, south to Florida and Texas, reaching its greatest development of 50 meters tall, with a trunk diameter of 1.5 m., in the central States.

The branches are ascending or spreading, the tree oblong in outline. The bark is up to 4 cm. thick, rough and fissured into rounded ridges and broken into thick dark brown to nearly black close plates; on younger stems it is smooth and dark brown; internally it is deep orange-colored and tinges the saliva yellow on chewing. The twigs are stout and scurfy, becoming nearly smooth, reddish or reddish brown, ultimately dark brown. The winter buds are ovoid, about 10 mm. long, angular, narrowed upward to a blunt point and woolly. The leaves are deep red and very hairy when unfolding, becoming greenish white at flowering time; they are oval in outline, 1 to 3 dm. long; the 5 to 7, rarely 9, lobes are broad, oblong to triangular, bristle-pointed, usually bristle-toothed, the sinuses wide and rounded, sometimes extending nearly to the midrib; the base is usually wedge-shaped; they are thick, or almost leathery, dark green and shining, with a prominent rounded midrib above, dull yellowish green or brownish with rusty hairs, or sometimes smooth except for small tufts of brown hairs in the axils of the prominent venation beneath, turning reddish yellow, or brown before falling late in the autumn. The leaf-stalk is stout, flattened on the upper side, yellowish and smooth, 1 to 6 cm. long. The flowers appear when the leaves are about one half unfolded, the staminate in clusters of slender, woolly or hairy, many-flowered catkins 10 to 15 cm. long, their calyx pale and hairy, its lobes ovate and sharp-pointed; stamens 4, exserted; anthers ovate and sharp-pointed, yellow and hairy. The pistillate flowers are on short, woolly stalks, their involucre scales ovate; calyx-lobes longer than the involucre, sharp-pointed, and hairy; styles long, re-



FIG. 240. — Black Oak.

and rounded, sometimes extending nearly to the midrib; the base is usually wedge-shaped; they are thick, or almost leathery, dark green and shining, with a prominent rounded midrib above, dull yellowish green or brownish with rusty hairs, or sometimes smooth except for small tufts of brown hairs in the axils of the prominent venation beneath, turning reddish yellow, or brown before falling late in the autumn. The leaf-stalk is stout, flattened on the upper side, yellowish and smooth, 1 to 6 cm. long. The flowers appear when the leaves are about one half unfolded, the staminate in clusters of slender, woolly or hairy, many-flowered catkins 10 to 15 cm. long, their calyx pale and hairy, its lobes ovate and sharp-pointed; stamens 4, exserted; anthers ovate and sharp-pointed, yellow and hairy. The pistillate flowers are on short, woolly stalks, their involucre scales ovate; calyx-lobes longer than the involucre, sharp-pointed, and hairy; styles long, re-

flexed, and light red. The fruit, ripening in the autumn of the second year, is sessile or nearly so, commonly solitary; the nut is subglobose, oblong or ovoid, 1.5 to 2.5 cm. long, reddish brown, often faintly striped, sometimes coated with reddish hairs, its shell thick; cup top-shaped or hemispheric, 2 to 2.5 cm. across,



FIG. 241. — Black Oak, Carnot, Pennsylvania.

dark reddish brown on inner surface, embracing about half of the nut, covered with coarse, loose, thin, light brown, ovate, sharp-pointed, hairy scales.

The wood is strong, but not tough, coarse-grained, light reddish brown; its specific gravity is about 0.70. The bark is used in tanning, also as a yellow dye, and sparingly as an astringent medicine.

It is rarely planted for ornament, as the Scarlet oak and the Red oak, over which it has no advantages, much excel it in beauty.

It is also called Yellow oak, Quercitron oak, Yellow-barked oak, Yellow bark, Dyer's oak, Tan bark oak, and Spotted oak.

7. GRAY OAK — *Quercus borealis* F. A. Michaux

Quercus ambigua F. A. Michaux not H. B. K.

A tree very similar to the Red oak in foliage and general appearance, but with acorns resembling those of the Scarlet oak. It occurs from Quebec and Ontario southward to New York and Pennsylvania, and perhaps, in the mountains to North Carolina, attaining a maximum height of 18 meters and a trunk diameter of 4.5 dm.

The twigs are rather slender, hairy at first, becoming smooth, reddish brown or grayish brown. The winter buds are narrowly ovoid, sharp-pointed, brown and downy. The leaves are ovate to obovate in outline; the 7 to 13 lobes are wedge-shaped, usually with several long bristle-tipped teeth, the sinuses rather narrow, extending to a little beyond the middle and more or less rounded, the leaf base broadly tapering or obtuse; they are thin and firm, deep green and dull, with broad, yellowish midrib above, paler and smooth except at the axils of the veins beneath. The leaf-stalk is slender, slightly grooved, thickened at the base, 3 to 5 cm. long. The pistillate flowers are bright red with long spreading styles. The acorns, ripening in the autumn of the second season, are solitary or 2 or 3 together; nut ovoid, about 2.5 cm. long; cup top-shaped or hemispheric, 1.5 to 2 cm. across, reddish brown and hairy inside, embracing one third to one half of the nut, covered with broad, blunt, reddish, rather smooth scales.

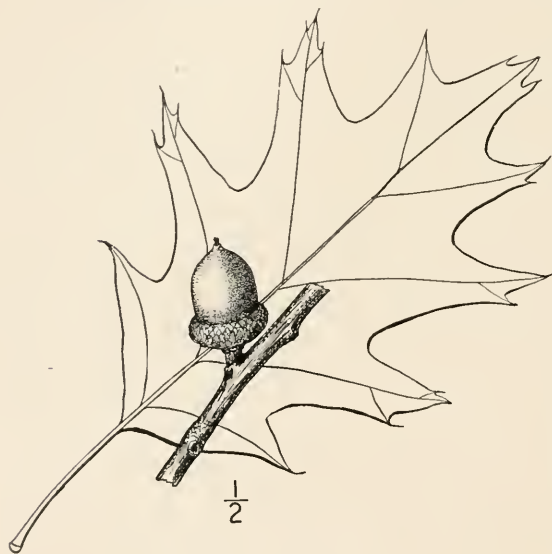


FIG. 242. — Gray Oak.

The wood resembles that of the Red oak, and is used for the same purposes, but it is said to be stronger and more durable.

The tree is supposed to occur further north than any other oak of our area, and should prove to be very desirable in the north for parks and shade.

8. HILL'S OAK — *Quercus ellipsoidalis* E. J. Hill

A tree of clay soils from northern Illinois and Michigan, westward to eastern Iowa and southeastern Minnesota, apparently very local and related to the Black oak, *Q. velutina* Lamarck, and the Scarlet oak, *Q. coccinea* Muenchausen, of which it has been considered a hybrid. Its maximum height is 21 meters, with a trunk diameter of 1.2 m. It is also called Yellow oak and Black oak.

The branches are much divided, often drooping and usually long persistent on the lower portion of the trunk, the tree oblong in outline. The bark is rather thin, shallowly fissured into close narrow thin, dark brown plates, yellow internally; on younger stems it is quite smooth, varying from gray to grayish brown. The twigs



FIG. 243. — Hill's Oak.

are slender, at first appressed-hairy, soon becoming nearly smooth, light reddish brown, finally dark gray or brown. The winter buds are ovoid, 6 mm. long, sharp or blunt-pointed, slightly angular, reddish brown and shining. The leaves are oval, obovate to nearly orbicular in outline, 6 to 15 cm. long; the 5 or 7 lobes are oblong to triangular with bristle-pointed teeth; the sinuses are very deep, wide, and rounded or obovate, the base is broadly wedge-shaped or blunt. They are thin but firm in texture, bright green and shining above, with a prominent yellowish rounded midrib and primary veins, paler, and smooth except for tufts of hairs at the axils of the prominent venation beneath, turning yellowish or brownish, often variegated with red and purple before falling in the autumn. The leaf-stalk is slender, grooved, and usually smooth, 2.5 to 5 cm. long. The flowers

appear when the leaves are about one fourth unfolded, the staminate in slightly hairy catkins 5 to 8 cm. long, their calyx usually reddish and hairy; stamens about as long as the calyx, their anthers oblong, notched at each end. The pistillate flowers are on short, stout, woolly, 1- to 3-flowered peduncles; involucrel scales and the 4- to 7-lobed calyx hairy; styles 3, spreading or recurved and dark colored. The fruit, ripening in the autumn of the second season, is sessile, solitary or in pairs; nut ellipsoid or varying from cylindric to globose-ovoid, 12 to 18 mm. long, brown, often striped and slightly hairy; shell thin, dark and velvety inside; seed yellow and bitterish; cup top-shaped, 12 to 18 mm. across, narrowed at the base, reddish brown inside, embracing one third to one half of nut; scales ovate, blunt and imbricated.

Wood coarse-grained, resembling that of *Q. velutina*.

9. TEXAN OAK — *Quercus texana* Buckley

A small tree with spreading branches, in dry, rocky soil of southern and western Texas, where it is called Red oak, Spotted oak, and Spanish oak.



FIG. 244. — Texan Oak.

The bark is light brown and scaly. The twigs are slender, smooth, reddish or grayish brown, the winter buds elliptic, about 3 mm. long, blunt, dark brown and smooth. The leaves are oblong to obovate in outline, 5 to 10 cm. long, the 3 to 7 lobes narrowly triangular to ovate, the terminal one the longest, sometimes toothed, the lobes bristle-pointed, the sinuses oblique and broad; they are deep green, smooth, somewhat shining above, yellowish or brownish, smooth or slightly hairy,

with prominent reddish venation beneath. The leaf-stalk is slender, 1 to 3 cm. long, smooth and red. The flowers appear with the unfolding leaves, the staminate in rather many-flowered clustered slender hairy catkins 4 to 6 cm. long. The fruit ripens in the autumn of the second year, and is nearly sessile; nut oblong

or ovoid-oblong, 12 to 14 mm. long, light brown; shell thin and downy inside; cup hemispheric, 9 to 12 mm. across, brown and hairy inside, embracing about one third of the nut, covered by ovate, blunt, hairy crisp-margined scales, the upper smaller and forming a slight fringe around the rim of the cup.

The hard wood is close-grained, reddish brown; its specific gravity is about 0.91.

10. SCARLET OAK — *Quercus coccinea* Muenchausen

A tree preferring sandy, dry soil, from Maine to Minnesota, North Carolina and Missouri, attaining a maximum height of 50 meters, with a trunk diameter of 1.5 m. It is also called Red oak, Black oak, and Spanish oak.

The lower and middle branches are widely spreading, the upper ones ascending. The bark is about 2 cm. thick, shallowly fissured into irregular ridges, reddish internally, light brown and scaly on the outside; on younger stems it is smoother and brown. The twigs are scurfy hairy, soon becoming light green and shining, red or orange and finally dark brown. The winter buds are narrowly ovoid, about 6 mm. long, brown and somewhat hairy. The leaves are red when unfolding, pale hairy above, woolly beneath, becoming green and shining as the flowers appear; they are oval, oblong or obovate in outline, 1 to 2 dm. long, the 5 to 7 lobes ascending or spreading, slightly toothed and bristle-tipped, the sinuses wide and rounded; they are widely tapering or rounded at the base, thin and firm, deep bright green, smooth and very shining, with a slender yellow midrib above, paler and somewhat shining, often with tufts of rusty hairs at the axils of the larger veins beneath. They become brilliantly scarlet in the autumn before falling; the leaf-stalk is slender and round, 2 to 6 cm. long. The flowers appear when the leaves have about one half unfolded, the staminate in rather numerous, smooth, slender, many-flowered catkins 7.5 to 10 cm. long, their calyx hairy, its 4 or 5 lobes ovate and sharp-pointed; stamens usually 4, exserted; anthers ovate, sharp-pointed and light yellow. The pistillate flowers are on hairy peduncles up to 12 mm. long, bright red; styles elongated, spreading or recurved. The fruit, ripening in the autumn of the second season, is solitary, or 2 together, sessile or nearly so; nut ovoid or oblong-ovoid, from 1 to 2 cm. long, light reddish brown, sometimes striped; shell thin, thickly woolly inside; cup top-shaped, constricted at the base, 1.5 to 2 cm. across, thin

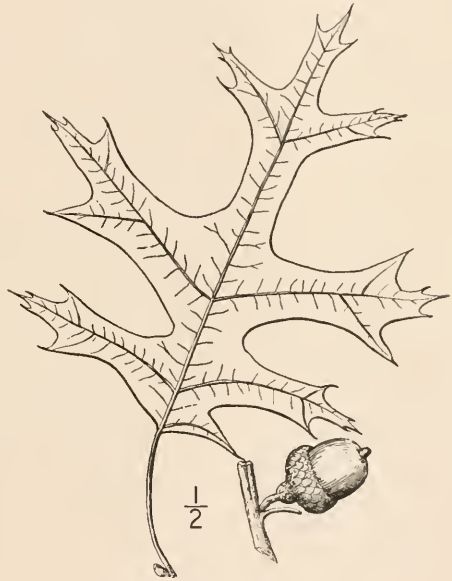


FIG. 245. — Scarlet Oak.

and embracing one third to one half of nut, the scales closely imbricated, sharp-pointed, brown and smooth or finely hairy.

The wood is hard, strong and coarse-grained, reddish brown; its specific gravity is about 0.71; it is used for the same purposes as that of the Red oak, but is not as valuable.

Its comparatively rapid growth, beautiful foliage, and brilliant autumnal coloration, which lasts longer than that of any of its competitors, make the Scarlet oak one of the most desirable trees for street or park.

A supposed hybrid with the Bear oak, *Q. ilicifolia* Wangenheim, has been found in Massachusetts.

II. CALIFORNIA BLACK OAK — *Quercus Kelloggii* Newberry

Quercus californica (Torrey) Cooper. *Quercus tinctoria californica* Torrey

A tree of the mountain ranges of California and southwestern Oregon, reaching its maximum development of 30 meters tall and a trunk diameter of 1.8 m.,

at an altitude of about 1800 meters; at very high altitudes it is reduced to a shrub. It is also known as Kellogg's oak, Mountain black oak, and Black oak.

The stout branches are widely spreading, the tree becoming round topped. The bark is 4 cm. thick, furrowed, the ridges broken into irregular, oblong scaly plates, dark brown or black; on younger stems it is smooth and light brown. The twigs are hairy at first, becoming



FIG. 246. — California Black Oak.

smooth, light red or brown and finally darker red-brown. The winter buds are ovoid, gradually tapering to a sharp point, 5 mm. long, brown, and somewhat hairy. The leaves are oblong or obovate in outline, 7.5 to 15 cm. long, the usually 7 lobes, wedge-shaped to broadly ovate, coarsely bristle-tipped, toothed or sometimes entire, the middle pair of lobes much the largest, the sinuses oblique, wide and usually rounded at the bottom, the base of the leaf obliquely wedge-shaped or rounded; they are thick, firm, dark yellowish green and shining, occa-

sionally with a few hairs above, paler, sometimes brownish, smooth or with a few hairs beneath, turning yellow or brown before falling in the autumn. The leaf-stalk is slender, almost round, 2.5 to 5 cm. long and yellow. The flowers appear in April and May when the leaves are half unfolded, the staminate in clustered hairy catkins 5 to 10 cm. long, their hairy calyx with 4 or 5 broadly ovate, sharp-pointed lobes; stamens 4 or 5, exserted; anthers ovate, sharp-pointed, smooth. The pistillate flowers are on short hairy stalks, their involucrel scales pale woolly, as are the sharp-pointed calyx-lobes; the styles are long, much recurved and deep red. The fruit, ripening in the autumn of the second year, is usually short-stalked, either solitary or clustered; nut oblong to ovoid, 2.5 to 4 cm. long, light brown, often with darker stripes; shell thin, woolly inside; cup about as high as wide, deeper than that of any related species, 2 to 2.5 cm. across, light brown on inner surface, embracing one third to one half of the nut, the scales thin, close, brown and shining, often forming a narrow fringe around the rim.

The wood is strong but brittle, coarse-grained and light reddish brown; its specific gravity is about 0.64. It is used to some extent for interior finishing and for furniture, especially in Oregon, but mostly for fuel. The astringent bark is used to a limited extent in tanning.

12. SPANISH OAK — *Quercus triloba* Michaux

Quercus falcata Michaux. *Quercus digitata* (Marshall) Sudworth

Quercus nigra digitata Marshall

A tree of dry gravelly or sandy soils, from New Jersey to Missouri, Florida and Texas, most abundant in the Gulf States, where it reaches its maximum height of about 30 meters, with a trunk diameter of 1.5 m. It is sometimes called Red oak and Spanish water oak.

The branches are stout and spreading, usually forming a round-topped tree. The bark is about 2 cm. thick, shallowly furrowed, the ridges brown, scaly. The twigs are stout, yellowish or brownish hairy, becoming almost smooth, dark reddish brown or gray. The winter buds are ovoid, sharp-pointed, about 5 mm. long, light brown and hairy. The leaves are ovate to obovate or oval in outline, 7.5 to 20 cm. long, the 3 to 7 usually lanceolate lobes bristle-tipped, as are the occasional teeth of the lobes, the terminal lobe often much elongated, the base is rounded or narrowed; they are thin but firm, dark green and shining above, densely woolly with grayish hairs and a prominent



FIG. 247. — Spanish Oak.

hairy midrib beneath, becoming orange-brown or yellow before falling in the autumn. The leaf-stalk is slender and hairy, 1 to 5 cm. long. The flowers appear from March to May, as the leaves unfold. The staminate flowers are in clustered slender woolly catkins 7.5 to 12.5 cm. long, their calyx hairy, the 4 or 5 lobes ovate, blunt; stamens exserted, 4 or 5; anthers oblong, notched, smooth, and yellow. The pistillate flowers are on stout hairy stalks, their involucre scales brown woolly, the calyx-lobes sharp-pointed; styles elongated, nearly upright, dark red. The fruit, ripening in the autumn of the second season, is short-stalked; nut subglobose, 1 to 1.5 cm. long, yellowish brown; cup hemispheric or top-shaped, 15 to 18 mm. across, reddish brown within, embracing about one fourth of the nut, its scales thin, oblong, reddish and covered with pale hairs.

The wood is hard and strong, coarse-grained and light red; its specific gravity is about 0.69. It is not very durable and checks badly on drying, and is sparingly used for construction purposes but quite extensively for fuel. The astringent bark is sometimes used in tanning and, like the bark of most all oaks, is sometimes used in domestic medicine.

Of very distinct appearance, it is quite desirable as a shade tree for park planting, wherever it has proven hardy; it is considerably used in the streets and parks of our southern States.

A supposed hybrid with the Black oak, *Q. velutina* Lamarck, is reported from Tennessee and North Carolina.

13. ELLIOTT'S OAK — *Quercus pagodæfolia* (Elliott) Ashe

Quercus falcata pagodæfolia Elliott

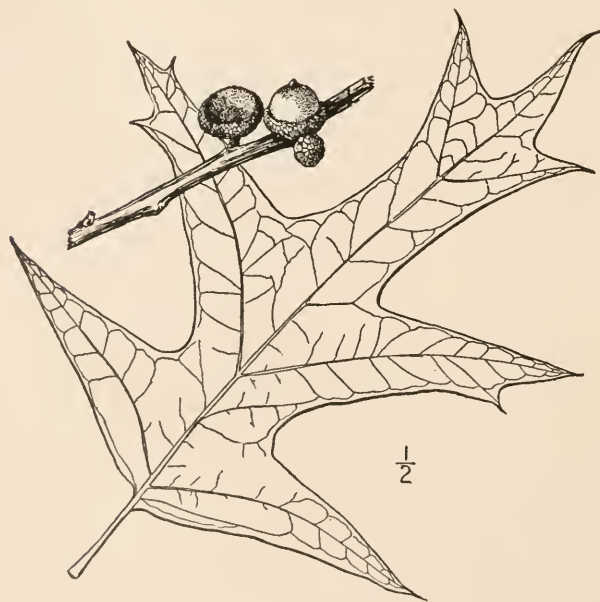


FIG. 248. — Elliott's Oak.

A tree of swamp borders and along streams from Long Island to southern Illinois and Missouri, southward to northern Florida and Arkansas, attaining a maximum height of 32 meters, with a trunk diameter of 1.5 m. Also called Swamp spanish oak and Red oak.

The branches are large, stout and widely spreading or ascending, forming a large, spreading, round tree in the open; in the forest the branches are more slender and form a narrow head, supported by a tall massive

trunk. The bark is 2.5 cm. thick, with rather close plate-like scales of a grayish or gray-brown color. The twigs are slender, thickly velvety, becoming slightly hairy and dark reddish brown. The buds are ovoid, 6 mm. long, often 4-angled, reddish or brown. The leaves are ovate to oblong in outline, 1.5 to 3 dm. long; the 5 to 11 lobes are triangular-lanceolate or narrowly wedge-shaped, usually spreading, sometimes toothed or lobed near the sharp-pointed apex, the sinuses wide, deep and rounded at the bottom, the base gradually narrowed and wedge-shaped, truncate or rounded. They are dark green and very shining above, pale or silvery white and persistently woolly beneath, becoming bright red or yellow before falling in the autumn; the petiole is stout and hairy, 1.5 to 5 cm. long. The flowers appear with the leaves, the staminate in slender hairy catkins, 5 to 7.5 cm. long, their calyx hairy, its 4 or 5 lobes rounded and reddish; stamens 4 or 5, exserted, their anthers notched and yellow. The pistillate flowers are solitary or 2 or 3 together on short hairy stalks; involucre scales hairy; styles elongated, spreading and dark red. The fruit, which ripens in the autumn of the second season, is short-stalked or almost stalkless; nut subglobose, about 1 cm. long, light yellowish brown; shell thin, woolly inside; cup shallowly top-shaped, smooth on the inner surface, embracing about one half of nut, its scales oblong, pale and hairy.

The wood is hard, strong and tough, rather close-grained, light reddish brown. It is sawn into lumber and highly valued for construction.

This species is very similar indeed to forms of the Spanish oak.

14. BEAR OAK — *Quercus ilicifolia* Wangenheim

Quercus rubra nana Marshall. *Quercus nana* (Marshall) Sargent

Usually a shrub with irregular stems and very stiff branches, forming dense thickets over wide areas of sterile lands from Maine to Ohio, North Carolina and Kentucky. It occasionally becomes a tree, reaching its greatest dimensions in New Jersey and Pennsylvania, a height of 7 meters, with a trunk diameter of 2 dm.

As a tree the branches are much divided, spreading, forming a round-topped head. The bark is thin, smooth, except for small close thin scales, and grayish brown. The twigs are slender, quite hairy, becoming red, brown or gray, and finally smooth or very nearly so. The winter buds are ovoid, blunt, 3 mm. long, with hairy brown scales. The leaves are obovate or oval in outline, 5 to 12.5 cm. long, the 5 to 7 short, triangular or ovate lobes bristle-tipped and sometimes toothed, their sinuses wide and shallow, the base broadly or nar-



FIG. 249. — Bear Oak.

rowly wedge-shaped; they are thick and firm, deep dark green and shining above, pale gray and finely hairy with prominent midrib beneath, turning scarlet, yellow-brown before falling. The leaf-stalk is slender, almost round, smooth or hairy, 1 to 2.5 cm. long. The flowers appear in April and May, when the leaves are about one half unfolded, the staminate in clustered slender, hairy catkins 5 to 10 cm. long; calyx 3 to 5-lobed, with ovate lobes; stamens 3 to 5, exserted; anthers oblong, sharp-pointed. The pistillate flowers are on stout, hairy stems, the calyx-lobes red-woolly, ovate; styles rather short, spreading and dark red. The fruit ripens in the autumn of the second season, usually 2 together, short-stalked or nearly sessile; nut ovoid, globose or depressed globose, 1 to 1.5 cm. long, light brown, striped and shining; shell thin, thickly woolly inside; cup saucer-shaped, 15 to 18 mm. across, light reddish brown on inner surface, thick and embracing nearly half of the nut, its reddish brown ovate scales finely hairy.

It is also known as Barren oak, Dwarf black oak, Scrub oak, and Shrub oak. On the Kittatinny Mountains of New York, New Jersey and Pennsylvania, the thickets formed by this shrub are sometimes so dense and tangled as to be penetrated only with great difficulty.

15. BLACK JACK OAK — *Quercus marilandica* Muenchhausen

Quercus nigra Wangenheim, not Linnæus. *Quercus cuneata* Wangenheim

A tree of sterile soils from Long island, New York, to Pennsylvania, Indiana and eastern Nebraska, southward to Florida and Texas. Its maximum size, 20 meters, with a trunk diameter of 1 m., is attained in Arkansas and Texas.



FIG. 250. — Black Jack Oak.

The lower stout branches are spreading, the upper ascending, the tree being usually compact and round-topped. The bark is up to 4 cm. thick, deeply fissured into angular plates often 7.5 cm. across and covered by appressed brown to nearly black scales. The twigs are stout, woolly at first, becoming scurfy, reddish brown and finally smooth or nearly so, and dark brown or gray. The winter buds are ovoid or oval, 6 mm. long, angular, sharp-pointed, reddish brown and densely brown-hairy. The leaves are broadly or narrowly obovate, 7 to 18 cm. long, the lobes 3 or 5, the terminal one often large and with bristle-tipped

teeth near the apex, sinuses usually very shallow and rounded, the base narrowly rounded or heart-shaped; they are thick, almost leathery, deep green, smooth and shining, with a broad midrib above, paler or yellowish brown, with brownish scurfy hairs and prominent venation, or finally smooth beneath, turning brown or yel-

lowish before falling; their leaf-stalks are stout, grooved, 5 to 10 mm. long, smooth or hairy, yellowish. The flowers appear from March to May, according to latitude, when the leaves are half unfolded, the staminate in clustered hairy catkins 5 to 10 cm. long, their calyx reddish and hairy, the 4 or 5 lobes ovate and rounded; stamens usually 4, slightly exserted; anthers oblong, sharp-pointed, red. The pistillate flowers are on short hairy stalks, their involucre scales brown-woolly, about equaling the length of the sharp-pointed calyx-lobes; styles short, broad, slightly reflexed and red. The fruit, ripening in the autumn of the second year, is solitary, or 2 together, short-stalked; nut subglobose or ovoid, 1 to 2 cm. long, light brown, more or less woolly coated inside; cup depressed hemispheric, constricted at the base, 12 to 20 mm. across, light brown on the inner surface, embracing about one half of the nut and covered by large scales, the smaller upper scales forming a loose rim around the top of the cup.

The wood is hard and strong, coarse-grained and dark brown; its specific gravity is about 0.73. It checks badly and is seldom used except for fuel and the production of charcoal.

This is a handsome tree and will add pleasing variety to any landscape into which it may be introduced, though it is of very slow growth.

Several supposed hybrids are recorded, Britton's Oak, *Q. Brittoni* Davis, of Staten island, New York, is considered a cross with the Bear oak, *Q. ilicifolia*. A cross with the Black oak, *Q. velutina* Lamarck, from the Indian Territory, has also been reported.

It is also called Black Jack, Barren oak, Barrens oak, Iron oak, Jack oak, and Scrub oak.

16. WATER OAK — *Quercus nigra* Linnæus

Quercus aquatica Walter

A tree of wet sandy soils, by streams or swamps, occurring from southern Delaware to Florida, Missouri, Tennessee, and Texas, reaching a maximum height of about 30 meters, with a trunk diameter of 1 m.

The numerous branches are rather slender, spreading or ascending, the outline of young trees being nearly conic, the fully developed ones round-topped. The bark is up to 18 mm. thick, nearly smooth, with a scaly surface of a light brown or reddish brown color. The twigs are slender, smooth, reddish, becoming gray to brown. The winter buds are ovoid, angular, sharp-pointed, their brown hairy scales slightly fringed. The leaves are mostly oblanceolate or spatulate, 5 to 15 cm. long, very variable, entire, with a large terminal lobe, sometimes 3-

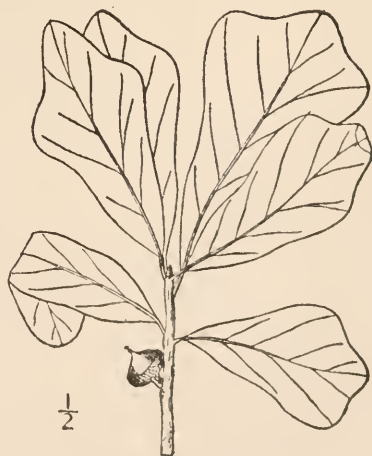


FIG. 251. — Water Oak.

lobed, or sometimes 5-lobed, the apex bristle-pointed, sharp or rounded, the base narrowly wedge-shaped; they are thickish and firm, dull green and smooth on both sides, or sometimes with tufts of brown hairs beneath, the rounded midrib raised on the upper surface, the venation conspicuous; they usually persist into the winter before falling; the leaf-stalk is stout, flattened and grooved, 2 to 7 mm. long. The flowers appear from February to April, the staminate in clustered slender-stemmed catkins 5 to 7.5 cm. long, their calyx hairy, its 4 or 5 lobes ovate and blunt; stamens 4 or 5, slightly exserted, their anthers oblong, notched and yellow. The pistillate flowers are on short hairy stalks, the hairy involucral scales shorter than the calyx-lobes; styles short, reflexed, red. The fruit, ripening in the autumn of the second season, is sessile or nearly so, mostly solitary; nut subglobose, 1 to 1.3 cm. long, yellowish brown, hairy and striped; shell thick, hairy inside; cup saucer-shaped or hemispheric, 12 to 15 mm. across, yellow and silky inside, embracing one fourth to one third of the nut, covered with ovate sharp-pointed close scales, which are reddish brown and hairy.

The wood is hard and strong, close-grained and light brown; its specific gravity is about 0.72. It is extensively used for fuel.

It is also called Spotted oak, Duck oak, Punk oak, and Possum oak.

17. SMALL FRUITED OAK — *Quercus microcarpa* Small

This shrub sometimes becomes a crooked branched tree 5 meters tall. It is known only from the rocky soils of Little Stone Mountain, Georgia.



FIG. 252. — Small-fruited Oak.

The twigs are slender and quite smooth and dark brown. The winter buds are ovoid, about 4 mm. long, slightly hairy and light brown. The leaves are

spatulate-obovate, 5 to 10 cm. long, wavy or somewhat deeply lobed on the margin, rounded at the apex, bristle-tipped, wedge-shaped at the base. They are thin and firm, grayish green, smooth and dull with yellowish midrib above, yellowish green, smooth, with yellow venation beneath; the leaf-stalk is short and stout. The fruit ripens in the autumn of the second season, and is sessile or nearly so; nut globose-ovoid, about 8 mm. long, yellowish brown, hairy toward the apex; cup deeply saucer-shaped, 5 to 7 mm. across, light brown and hairy inside, embracing about one third the nut and covered by relatively large thick scales.

18. WILLOW OAK — *Quercus Phellos* Linnæus

This oak prefers wet, sandy soil, and principally occurs along swamps and streams, but sometimes on higher land, from Long island, New York, to Florida, westward to Kentucky, Missouri and Texas. Its maximum height is 25 meters, with a trunk diameter of 1 meter.

The branches are slender, spreading and ascending, forming a round-topped tree when growing in the open. The bark is 12 to 18 mm. thick, reddish brown, shallowly fissured into irregular small scaly plates only on very large trunks, otherwise it is smooth. The twigs are slender, reddish brown, becoming dark gray or brown. The winter buds are ovoid, sharp-pointed, 3 mm. long and dark brown. The leaves are linear-oblong, narrowly elliptic, or sometimes lanceolate or oblanceolate, 4 to 10 cm. long, entire, the margins sometimes slightly wavy, sharp and bristle-pointed at the apex, narrowed to a pointed base. They are thick, almost leathery, smooth and shining with yellow midrib above, usually smooth or somewhat hairy beneath at the axils of the prominent venation, especially when young; they rarely persist all winter, usually turning yellow and fall in late autumn. The



FIG. 253. — Willow Oak.

leaf-stalk is stout and grooved, 2 to 5 mm. long. The flowers appear shortly after the leaves begin to unfold; the staminate catkins are slender, hairy, 2.5 to 4 cm. long, their calyx hairy, yellow, 4- or 5-lobed; stamens 4 or 5; anthers oblong, sharp-pointed, smooth, and yellow. The pistillate flowers are on smooth, slender stalks; involucre pale hairy, shorter than the sharp-pointed calyx-lobes; styles reflexed, light green. The fruit, ripening in the autumn of the second season, is usually solitary, sessile or nearly so; nut subglobose, depressed or globose-ovoid, about 1 cm. long, light yellowish brown with a pale hairy coating inside; cup saucer-shaped, 1 to 1.5 cm. across, reddish brown and silky inside, embracing only the base of the nut and covered with close thin hairy scales of a dark reddish brown color.

The wood is rather soft, strong, somewhat coarse-grained, and light brown; its specific gravity is about 0.75. It is used to a small extent for general construction and in wagon making.

The Willow oak is extensively planted as a shade and street tree from Philadelphia southward, and is hardy in southern New England. It is also known as the Peach oak, Water oak, Swamp oak, and Pin oak.

It hybridizes with several other oaks; the best known hybrid is Bartram's oak, *Q. heterophylla* Michaux, a cross with the Red oak, *Q. rubra* Linnæus, having characters of both species; the observation of seedlings has demonstrated its origin; it has been found from Staten island, New York, to North Carolina. Rudkin's oak, *Q. Rudkini* Britton, from New Jersey, is considered a hybrid with the Black Jack, *Q. marylandica* Muenchausen, but it may, perhaps, be a distinct species. From South Carolina a cross is reported with the Spanish oak, *Q. triloba* Michaux. A probable hybrid with *Q. ilicifolia* Wangenheim has been found in New Jersey.

19. CHAPMAN'S WATER OAK — *Quercus hybrida* (Chapman) Small

Quercus aquatica hybrida Chapman

A tree of rocky or sandy shores from Georgia to Florida and Mississippi, attaining a maximum height of 25 meters.



FIG. 254. — Chapman's Water Oak.

The bark is rough; the twigs are slender, smooth and ashy gray; buds oval, light brown. The leaves are oblong to wedge-shaped, 6 to 12 cm. long, sometimes 3-lobed or notched at the apex, otherwise entire on the margin, gradually or abruptly narrowed at the base. They are deciduous, dark green and smooth on both sides, the mid-rib impressed above, prominent and brownish beneath; the leaf-stalk is very short, stout and grooved. The fruit ripens the second season, and is quite ses-

sile; nut subglobose or ovoid-globose, 10 to 12 mm. long, light brown; shell thin; cup shallow, saucer shaped, 10 to 12 mm. across, thin, embracing only the base of the nut and covered by close, blunt hairy scales with dry crisp margins.

20. LAUREL OAK — *Quercus laurifolia* Michaux

A tree of river shores and swamps on the coastal plain from Virginia to Florida and Louisiana, attaining a maximum height of 30 meters, with a trunk diameter of 1 m.

The branches are rather slender, spreading or ascending, forming a dense, round-topped tree. The bark of large trunks is up to 5 cm. thick, fissured into flat nearly black ridges; on younger stems it is much thinner and nearly smooth or covered by scales of a brown color. The twigs are slender, smooth and reddish, becoming brownish and finally dark gray. The winter buds are narrowly ovoid or oval, pointed, slightly angled, 1.5 to 3 mm. long and bright red. The leaves are oblong to oval or obovate in outline, 4 to 13 cm. long, entire or rarely lobed, bristle-pointed, narrowed at the base, the margin somewhat thickened and revolute. They are firm in texture, green and very shining above, with round, prominent, raised, yellow midrib beneath, paler at maturity, smooth and shining, falling off irregularly during the winter; the leaf-stalk is stout, grooved above, yellowish, 1 to 3 mm. long. The flowers appear in March and April when the leaves are about one third unfolded, the staminate in clustered hairy catkins 5 to 8 cm. long, their calyx hairy on the outer surface, deeply 4-lobed; stamens 4 or 5, exserted; anthers oblong, slightly notched and yellow. The pistillate flowers are on short smooth stalks, the involucre brown and hairy, about as long as the pointed calyxlobes; styles recurved and red. The fruit, ripening in the autumn of the second year, is sessile or nearly so, usually solitary; nut ovoid or globose-ovoid, 1 to 1.5 cm. long, hairy at apex, dark brown, sometimes striped with green; shell thin, pale woolly inside; cup saucer-shaped, 1 to 1.5 cm. across, reddish brown and silky inside, embracing one fourth to one third of the nut, covered with thin, blunt, reddish brown scales.



FIG. 255. — Laurel Oak.

The wood is hard, strong, coarse-grained and dark brown or reddish brown; its specific gravity is about 0.77. It checks badly on drying and is seldom used except for fuel.

Except for its wider leaves and deeper cup this oak much resembles *Q. Phellos*. It is a handsome oak and is largely used as a shade or street tree in the southern cities, for which it is well adapted.

It is also called Swamp laurel oak, Darlington's oak, Willow oak, and Water oak.

21. SHINGLE OAK — *Quercus imbricaria* Michaux

A tree of rich woods from Pennsylvania to Michigan and Nebraska southward to Georgia and Arkansas, attaining its largest dimensions, 30 meters high with a trunk diameter of 1.2 m., in the central States. It is also known as Laurel oak, Jack oak, and Water oak.

The trunk is straight, often free of branches for half its height, with a round-topped crown; when young the lower drooping or spreading branches often touch

the ground. The bark is up to 4 cm. thick, shallowly and sparingly fissured into wide flat ridges, covered with close light reddish brown scales; that of younger stems is thinner, light brown and shining. The twigs are dark green and shining, becoming dark brown. The winter buds are ovoid, acute, 3 mm. long, slightly angular, light brown and shining. The leaves are oblong to lanceolate or oblanceolate, 6 to 20 cm. long, bristle-pointed, wedge-shaped or rounded at the base, entire, wavy, or rarely 3-toothed near the apex; they are thin and firm, dark green and very shining above, with a conspicuous broad yellow midrib, pale green or brownish and coated with soft hairs beneath, becoming bright red before falling in late autumn.



FIG. 256. — Shingle Oak.

The leaf-stalk is stout, flattened and grooved, 0.5 to 2 cm. long. The flowers appear in April and May when the leaves are one third unfolded. The staminate catkins are loosely hairy, 5 to 8 cm. long; calyx 4-lobed, hairy and light yellow; stamens 4 or 5, exserted; anthers oblong, notched, smooth and yellow. The pistillate flowers are on stout woolly stalks, their involucre scales as long as the sharp hairy calyx-lobes; styles rather short, reflexed and yellow. The fruit, ripening in the autumn of the second season, is solitary, or two together, on short stalks; nut ovoid or subglobose, 1 to 1.5 cm. long, dark brown, its shell thin with brownish hairs inside; cup nearly hemispheric to saucer-shaped, 1.5 to 2 cm. across, brown and shining inside, embracing one third to one half the nut, covered by ovate bluntish red-brown hairy scales.

The wood is hard, rather coarse-grained, light reddish brown; its specific gravity is about 0.75. It checks badly on drying and is used in construction work, and to a considerable extent for shingles, whence the common name.

This oak, distinct in its shining unlobed leaves, with deep red autumnal tints, affords opportunity to add pleasing variety to the shade-trees of our northern parks; it is of rather rapid growth.

A number of hybrids are credited to this species, Lea's oak, *Q. Leana* Nuttall, first seen near Cincinnati, Ohio, and reported from several other widely separated

localities, is considered to be a cross with the Black oak, *Q. velutina* Lamarek; a cross with the Black jack oak, *Q. marylandica* Muenchausen, and another with the Pin oak, *Q. palustris* DuRoi, have been reported from near St. Louis, Missouri.

22. UPLAND WILLOW OAK — *Quercus cinerea* Michaux

Quercus brevifolia (Lamarek) Sargent. *Quercus Phellos brevifolia* Lamarek

This tree of sandy uplands occurs from North Carolina to Florida and Texas, mostly not far from the coast. It attains a maximum height of about 30 meters, with a trunk diameter of 5 dm.

The branches are stout and stiff, forming a more or less irregular head or at times a broad round tree. The bark is up to 4 cm. thick, fissured into small angular plates, covered with brown to nearly black scales. The twigs are stiff, woolly at first, soon becoming smooth and dark reddish brown. The winter buds are ovoid, sharp-pointed, the scales brown. The leaves are oblong, lanceolate or oblanceolate, 5 to 12 cm. long, entire, wavy-margined or sometimes toothed or shallowly lobed, slightly bristle-tipped at the pointed or sometimes rounded apex, narrowly wedge-shaped or rarely rounded at the base, somewhat thickened on the margin. They are firm, pale green and shining, with yellowish midrib above, grayish woolly beneath, often long persisting, falling irregularly during the winter. The leaf-stalk is stout, grooved, 3 to 8 mm. long. The



FIG. 257. — Upland Willow Oak.

flowers appear with the leaves, the staminate catkins woolly, 5 to 8 cm. long; the flower buds are bright red; the 4 or 5 calyx-lobes are ovate, sharp-pointed, red, or yellow. The pistillate flowers are on short, stout, hairy stalks; involucral scales and calyx-lobes about equal in length and hairy; styles long, reflexed and dark red. The fruit, ripening in the autumn of the second year, is usually sessile and often very abundant; nut oblong to subglobose, 1.5 cm. long, light brown and striped, the apex hairy; cup saucer-shaped, 1 to 1.5 cm. across, reddish brown with shining hairs inside, thin, embracing about one fourth of the nut and covered by thin, ovate-lanceolate bluntish hairy scales, with reddish margins.

The wood is hard and strong, close-grained and light reddish brown; its specific gravity is about 0.64. It is used for fuel.

A hybrid with the Turkey oak, *Q. Catesbaei* Michaux, is reported from Florida, and one with the Spanish oak *Q. triloba* Michaux, from South Carolina.

This tree is also known as High ground willow oak, Sand jack, Turkey oak, Shin oak, Cinnamon oak, and Blue jack.

23. WHITE LEAF OAK — *Quercus hypoleuca* Engelmann

Usually a small tree, sometimes a shrub, occurring among coniferous trees in the mountains of southern Arizona, New Mexico, western Texas and northern, Mexico, attaining a maximum height of 18 meters, with a trunk diameter of 4 dm. It is also called Mexican oak, White-leaved oak, and Lance oak.



FIG. 258. — White-leaf Oak.

The branches are slender and spreading, the tree mostly round-topped. The bark is up to 2.5 cm. thick, deeply fissured into broad rough ridges, with a thick scaly, nearly black surface. The twigs are stout and stiff, velvety at first, becoming nearly smooth, reddish brown, sometimes glaucous and finally almost black. The winter buds are ovoid, blunt, 3 mm. long, their scales brown and pale margined. The leaves are lanceolate, oblong-lanceolate or

elliptic, 5 to 10 cm. long, sharp, mostly bristle-pointed, narrowed and wedge-shaped or rounded at the base, thickened and revolute on the entire, wavy or slightly toothed margin, the teeth often bristle-pointed; they are rather thick, yellowish green and shining with a slender midrib above, strikingly white-woolly and strongly veined beneath, turning yellow or brown, but persistent until after the new leaves appear, when they gradually fall off. The leaf-stalks are stout, flattened, much thickened at the base, 3 to 10 mm. long. The flowers appear from March to May, the staminate in slender, hairy catkins 7 to 12.5 cm. long, their calyx reddish and hairy, the 4 or 5 lobes ovate and blunt; stamens 4, much exerted; anthers ovate, sharp-pointed, smooth, yellow. The pistillate flowers are sessile or nearly so, involucre scales and calyx-lobes softly hairy; styles recurved, red. The fruit, ripening in the summer of the second season, is usually solitary and nearly sessile; nut ovoid, 15 to 18 mm. long, brown, hairy at the apex, its shell thick, white-woolly inside; cup broadly top-shaped to hemispheric, 10 to 13

mm. across, yellow and hairy inside, thick and embracing about one third of the nut, covered by the thin, close brown white-hairy scales.

The wood is very hard and strong, close-grained and dark brown; its specific gravity is about 0.80. The white under sides of the leaves make this oak a very interesting and conspicuous tree.

24. HIGHLAND OAK — *Quercus Wislizeni* A. de Candolle

A tree of the Coast Mountains to the western slope of the Sierra Nevada extending from northern California southward into Lower California. Its maximum height is 24 meters, with a trunk diameter of 1.8 m., but often shrubby, especially toward the southern part of its range, and forming most of the oak chaparral. It is also known as Live oak, Highland live oak, and Wislizenus' oak.

The trunk is usually short. The branches are stout and spreading, the tree mostly round-topped. The bark is up to 7.5 cm. thick, deeply fissured into wide rounded more or less confluent ridges, covered with close dark brown or reddish brown scales; on younger stems it is much thinner, quite smooth and lighter in color. The twigs are slender, stiff, more or less hairy, becoming quite

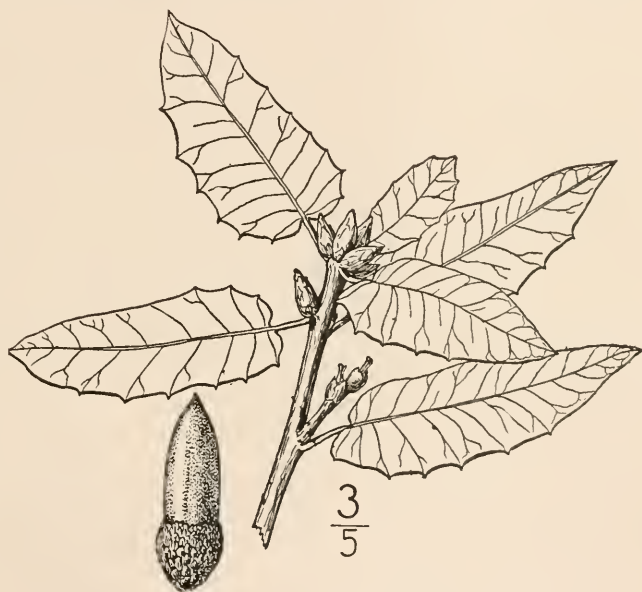


FIG. 259. — Highland Oak.

smooth, light reddish or grayish brown, finally dark brown. The winter buds are ovoid or oval, sharp-pointed, 3 to 6 mm. long, and dark brown. The leaves are oblong-lanceolate, lanceolate or oval, 2.5 to 4 cm. long, sharp or rounded, usually bristle-tipped at the apex, rounded, subcordate or narrowed at the base, entire, or toothed with bristle-tipped teeth; they are thick and leathery, dark green, smooth and shining, with a strong yellowish midrib above, bright yellow-green beneath, persistent until the second season, when they fall off gradually; leaf-stalk slender, nearly round, more or less hairy, 3 to 18 mm. long. The flowers appear from March to May with the leaves, the staminate in hairy catkins 7.5 to 10 cm. long; their calyx is deeply 5-lobed; stamens 3 to 6, exserted, their anthers oblong, sharp-pointed, smooth and yellow. The pistillate flowers are sessile or nearly so, hairy; styles sometimes more than 3, slender and recurved. The fruit ripens in the

autumn of the second year, is sessile or nearly so; nut oblong-oval, 18 to 35 mm. long, brown, often striped, the apex hairy; shell thin and hard, slightly hairy within; cup top-shaped, deeply saucer-shaped, or sometimes higher than wide, 12 to 15 mm. across, greenish and hairy within, thick and embracing one third to one half the nut, covered by thin, brown somewhat hairy scales.

The wood is very hard and strong, close-grained, light reddish brown; its specific gravity is about 0.78. It is used for fuel.

Abram's oak, *Q. Morehus* Kellogg, is supposed to be a hybrid with the California black oak, *Q. Kelloggii* Newberry. Price's oak, *Q. Pricei* Sudworth recently described, and perhaps distinct, has saucer-shaped acorn-cups.

25. MYRTLE OAK — *Quercus myrtifolia* Willdenow

Also called Scrub oak, this much branched evergreen shrub, rarely becomes a tree 6 meters tall, with a trunk diameter of 1 dm., growing on dry sandy ridges along the coast and adjacent islands from South Carolina to Florida and Louisiana.

The bark is slightly furrowed near the base, otherwise it is smooth and dark



FIG. 260. — Myrtle Oak.

brown. The twigs are slender, hairy at first, but becoming smooth, light brown to dark gray. The winter buds are ovoid or oval, narrowed to a sharp point, the scales close and brown. The leaves are obovate or oval, 2 to 5 cm. long, blunt or bristle-pointed, variously wedge-shaped, rounded or sometimes heart-shaped at the base, entire on young shoots, sometimes wavy or toothed on the revolute margin. They are thick and leathery, shining, dark green and smooth with a yellowish midrib and prominent venation above, yellowish green or brownish, smooth or somewhat hairy, especially at the axils of

the principal veins beneath, persisting until the second season, when they gradually fall off. The leaf-stalk is stout, hairy, and yellow, 1 to 3 mm. long. The flowers appear in March or April. The staminate catkins are hairy, 2.5 to 4 cm. long, their calyx hairy, the 5 lobes thin, ovate and sharp-pointed; stamens exserted; anthers small, sharp-pointed, smooth and yellow. The pistillate flowers are sessile or nearly so, single or two together; involucre woolly and reddish; styles long, recurved. The fruit, usually ripening at the end of the second season, is sessile or nearly so; nut ovoid or oblong-ovoid, 1 to 1.5 cm. long, dark brown and shining, often striped, hairy at the apex; shell thin, woolly inside; cup saucer-shaped, 10 to

13 mm. across, light brown and hairy inside, thin and embracing about one fourth of the nut, covered by ovate, brown hairy scales.

Like other shrubby oaks, this species forms dense thickets.

26. CALIFORNIA LIVE OAK — *Quercus agrifolia* Née

This usually evergreen tree occurs in western California along the Coast Mountains and on the coastal islands, extending into Lower California, reaching a maximum height of about 27 meters, with a trunk diameter of over 2 m., but usually much smaller and on sand dunes reduced to a nearly prostrate shrub. It is also called Evergreen oak, Coast live oak, and Live oak.

The trunk is short, usually dividing into several large widely spreading branches, but sometimes tall with short spreading branches forming a narrow head. The bark of old trunks is up to 7.5 cm. thick, furrowed into blunt ridges, with small close dark brown scales; that on younger stems is thinner, nearly smooth, and light brown or gray. The twigs are slender, woolly at first, becoming smooth only after about two years, when they are gray or reddish brown. The winter buds are ovoid or ovoid-oblong, 1.5 to 5 mm. long, brown, smooth or hairy. The leaves are ovate, orbicular or oblong, 4 to 10 cm. long, rounded or pointed and bristle-tipped at apex, rounded, heart-shaped, or rarely narrowed at the base; the thick revolute margin is entire or toothed with slender, stiff bristle-pointed teeth; they are

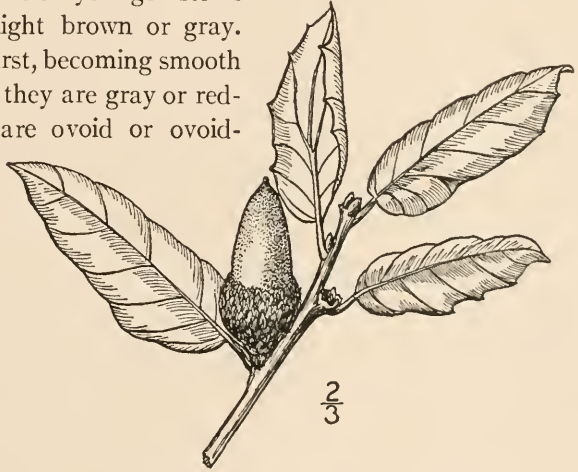


FIG. 261. — California Live Oak.

nearly leathery and convex, rather dark green, dull, slightly netted veined and sometimes hairy above, paler, somewhat shining, smooth or hairy, with tufts of hairs at the axils of the veins beneath, persisting until the new leaves have formed or sometimes fall before the new leaves appear; the leaf-stalk is stout or slender, smooth or hairy, 1 to 2 cm. long. The flowers appear in April or May, sometimes also in the autumn, the staminate in slender hairy catkins 7.5 to 10 cm. long; their calyx is deeply 5 to 7-lobed, the lobes sharp-pointed; stamens 6 to 10, slightly exserted; anthers oblong, notched, smooth and yellow. The pistillate flowers are sessile or nearly so, the reddish involucre woolly or rarely smooth; styles spreading and bright red. The fruit, ripening in the autumn of the first season, is sessile or nearly so, solitary or few together; nut narrowly ovoid, 18 to 36 mm. long, gradually tapering to a sharp, hairy apex and brown, the shell thin with a thick, woolly coating inside; cup top-shaped, about 1.5 cm. across, bright

brown and silky inside, embracing about one third of the nut, covered with thin oblong-lanceolate blunt scales.

The wood is hard, close-grained and brittle, reddish brown; its specific gravity is 0.82. It is seldom used except for fuel, for which, however, it is largely employed.

The fruit is used for food by the Indians of Lower California, by being ground into meal, washed, and baked into cakes.

Quercus pumila Walter, the Running oak of the southeastern States, from North Carolina to Florida, an evergreen shrub with long underground stems, thick narrow leaves, and small acorns ripening the first season, is not known to ever form a tree.

27. WILCOX'S OAK — *Quercus Wilcoxii* Rydberg

Rarely a tree 6 to 9 meters tall, this shrub occurs in the mountains of Utah, Nevada, Arizona, and probably in New Mexico and adjacent Mexico; it is very similar to the White live oak, *Q. chrysolepis* Liebm., of California.



FIG. 262. — Wilcox's Oak.

The bark is dark gray or brownish. The twigs are hairy, soon becoming smooth, gray or brown. The buds are small, hairy and brown. The leaves are ovate to broadly oval, 1 to 4 cm. long, abruptly short taper-pointed, tapering at the base to a stout petiole 1 to 4 mm. long, entire or with few bristle-tipped teeth on the revolute margin, those of vigorous sterile shoots quite different, broader or almost orbicular in outline, with rounded or heart-shaped base and deeply bristle-toothed margin; they are thick, firm and leathery, yellowish hairy when young, pale yellowish green, smooth and shining above, very pale, almost white, dull and punctate beneath, persisting until the new ones unfold. The fruit is stalked; nut ovoid, about 5 mm. long, light

brown and smooth inside; cup hemispheric, 10 to 14 mm. across, embracing about one fourth of the nut and covered by sharp-pointed, slightly thickened, somewhat hairy, ovate scales.

28. WHITE LIVE OAK — *Quercus chrysolepis* Liebm.

This evergreen oak occurs from southern Oregon south along the mountains to Lower California, reaching in its greatest development a height of 24 meters, with a trunk diameter of 2.7 m., in the foothills of the Sierra Nevada in central California. At high altitudes it is sometimes reduced to a shrub.

The trunk is usually short, divided into large widely spreading or drooping branches often touching the ground and forming a very broad tree, usually round-topped when not crowded. The bark is up to 4 cm. thick, smooth, except for some

small, close reddish gray or brown scales. The twigs are stiff and slender, hairy at first, becoming smooth or nearly so, and brown or light gray. The winter buds are broadly ovoid to oval, sharp-pointed, about 3 mm. long and brown. The leaves are oblong, elliptic to lanceolate, 2.5 to 10 cm. long, sharp and stiff-pointed, heart-shaped, rounded or wedge-shaped at the base; the thick, revolute margin is usually entire, sometimes toothed with spine-tipped teeth; they are thick and leathery, light yellowish green and smooth, with a sunken yellowish midrib above, yellowish woolly or finally whitish and smooth beneath; they persist for three or four years; the leaf-stalks are slender, grooved, yellow, about 1 cm. long. The flowers appear in May and June, the staminate



FIG. 263. — White Live Oak.

in clustered slender, hairy catkins 5 to 10 cm. long, their hairy calyx 5 to 7-lobed, often red tipped; stamens 6 to 8, exserted; anthers sharp-pointed, smooth and yellow. The pistillate flowers are sessile, solitary, or rarely spicate; involucre scales woolly; styles short, broad, spreading and light red. The fruit, ripening in the autumn of the second season, is usually solitary, short-stalked or sessile; nut oval or ovoid, 12 to 50 mm. long, light brown; shell thick and pale-hairy inside; cup hemispheric, top-shaped or deeply saucer-shaped, 4 cm. wide or less, very thick, brown within, its thick rim covered by short pointed very hairy scales.

The wood is hard, very tough and strong, close-grained, brownish; its specific gravity is about 0.85. It is very hard to cut and work, but is used to a limited extent for wagons and farm implements, pack saddles and tool handles.

It is also called California live oak, Canyon live oak, Black live oak, Canyon oak, Live oak, Iron oak, Hickory oak, Golden cup oak, Golden leaf oak, Valparaiso oak, Blue oak, and Maul oak.

29. ISLAND OAK — *Quercus tomentella* Engelm.

This very local tree is only known from the islands along the coast of southern California, and on Guadeloupe island further south. It is known to reach a height of 18 meters, with a trunk diameter of 6 dm.

The branches spread into a beautiful round-topped tree. The bark is thin and broken into large close reddish brown scales. The twigs are rather slender, quite densely stellate-hairy at first, finally becoming smooth or nearly so, and light reddish brown or orange. The winter buds are ovoid, sharp or blunt-

pointed, about 5 mm. long and covered by hairy scales. The leaves are ovate to oblong-lanceolate, rounded or wedge-shaped at the base, with thick-tipped teeth



FIG. 264. — Island Oak.

or quite entire on the strongly revolute margin. They are thick and leathery, dark green, smooth and shining above, pale and stellate-hairy, with a stout midrib and prominent venation beneath, persisting for two or more years, the leaf-stalk stout, flat, hairy and about 12 mm. long. The flowers appear from April to June, the staminate in hairy catkins 7 to 12 cm. long; the calyx is hairy, 5 to 7-lobed, light yellow; stamens 8 to 10, exserted; anthers oblong, sharp-pointed, yellow.

The pistillate flowers are nearly sessile or few together in spikes, their involucre scales and calyx hairy; styles short, flat, spreading and red. The fruit, ripening at the end of the second season, is nearly sessile or on short, stout stalks; nut ovoid-oval, 4 cm. long, its shell thick, somewhat scurfy hairy inside; the cup is hemispheric, about 2 cm. across, thin, light brown and hairy inside, thin-rimmed, embracing only about one fourth of the nut, covered by ovate, sharp-pointed, brown and very hairy scales.

The wood is hard, close-grained, yellowish brown; its specific gravity is about 0.72. It is used for fuel. The species is closely related to *Q. chrysolepis*.

30. LIVE OAK — *Quercus virginiana* Miller

Quercus virens Aiton. *Quercus Rolfsii* Small

This characteristic evergreen tree of low, sandy soil, mostly near the coast, occurs from Virginia to Florida and westward into Texas, also in Mexico, and it is abundant in western Cuba. It is a large and handsome wide-spreading round-topped tree, having a maximum height of 30 meters, a trunk diameter of 2.5 m., and sometimes a spread of 45 m.

The trunk is much buttressed at the base, short, and usually divided into several large outspreading branches, old trees almost globular in outline. The bark is up to 2.5 cm. thick, sparingly furrowed, and broken up into small, close

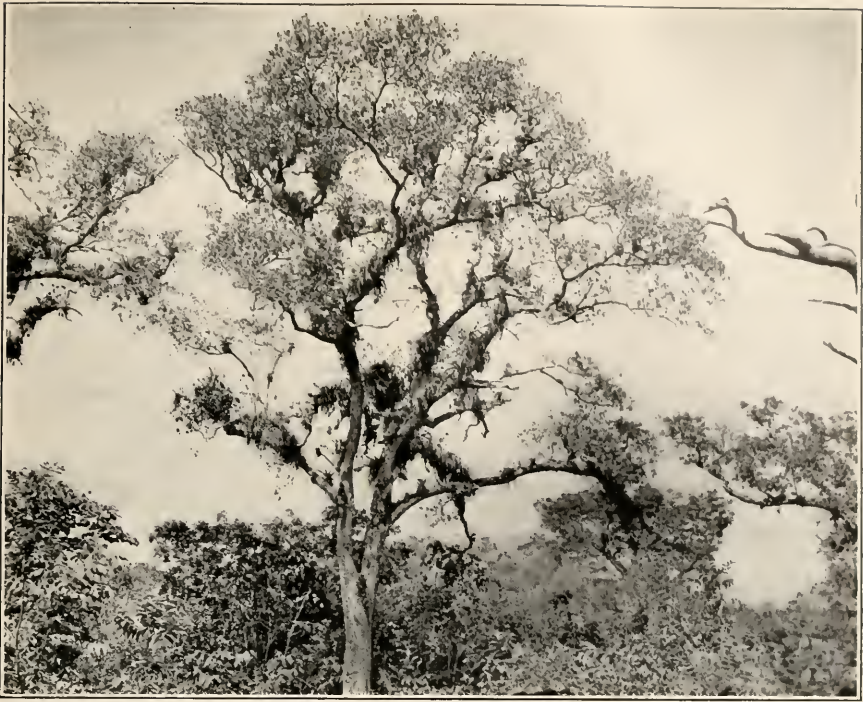


FIG. 265. — Live Oak, Miami, Florida.

reddish brown or grayish scales. The twigs are slender, stiff, woolly at first, becoming smooth, gray or brown. The winter buds are globose or broadly ovoid, 1.5 mm. long, light brown. The leaves are oblong, oval, or obovate, blunt or slightly pointed, narrowly wedge-shaped, or sometimes rounded or slightly heart-shaped at the base, usually entire on the more or less revolute margin, thick and leathery, dark green and shining above, pale, smooth or slightly hairy, but never rugose, beneath; the midrib is narrow and yellowish, the petiole stout, flattened and grooved, from 5 to 10 mm. long; they persist for about one year, turning yellow or brown before falling. The flowers appear in March or April, the staminate in hairy catkins 5 to 7.5 cm. long, their calyx light yellow, divided into 5 to 7 ovate, blunt hairy lobes; stamens little exserted; anthers oblong, notched, hairy and yellow. The pistillate flowers are spicate on slender hairy peduncles 2.5 to 7.5 cm. long, their involu-



FIG. 266. — Live Oak.

cal scales ovate; calyx-lobes hairy; styles short, broad, spreading, and light red. The fruit ripens in the first season, solitary or in spike-like clusters of 2 to 5, on short brown stalks; the nut is ovoid or oblong-ovoid, 2 to 2.5 cm. long, brown and shining, its seed sweet and light yellow; cup hemispheric, often somewhat constricted at the base, 1.5 to 2 cm. across, light yellow-brown and hairy inside, embracing about one third of the nut, covered with close, thin, brown, sharp-pointed, densely hairy scales.

The wood is hard, strong and tough, close-grained, and brown or yellow-brown with a satiny surface; its specific gravity is about 0.95. It has been largely used in ship building and in other structural work. The nuts were gathered and eaten by the Indians, who roasted them for food and also expressed an oil from them. These fruits are produced in great abundance and afford a valuable food for swine.

This is one of the most rapid growing of the American oaks as well as the grandest and most beautiful, and in the south it is one of the highly esteemed shade trees. It often harbors quantities of air-plants.

31. TWIN LIVE OAK — *Quercus geminata* Small

Usually a shrub, this live oak rarely becomes a tree, with a maximum height of 12 meters and a trunk diameter of 6 dm. It occurs in sandy scrub lands from Georgia to Florida and Mississippi.

The trunk is seldom upright, but usually ascending or bent. The bark is pale gray. The twigs are rather stout, yellowish downy, becoming quite smooth and light brown, finally gray to nearly black. The leaves are narrowly oblong, elliptic or oblong-lanceolate, blunt or pointed, usually gradually narrowed at the base, strongly revolute on the margin. They are thin, tough and parchment-like, wrinkled, reticulate, with the principal veins impressed, and smooth above, grayish and downy, with a prominent yellow midrib beneath. They persist for about a year; the petiole is stout, 2 to 6 mm. long. The fruit ripens the first year, usually in pairs, at the end of



FIG. 267. — Twin Live Oak.

a peduncle 4 cm. long or more; nut ovoid or narrowly ovoid, 10 to 17 mm. long, with prominent, persistent styles, dark brown and shining; shell very thin; cup top-shaped, 10 to 12 mm. across, light brown and hairy inside, thin and embracing

about one third of the nut, covered with woolly scales, which are slightly thickened toward the base, thinner, and forming a slight fringe around the rim of the cup.

Quercus minima (Sargent) Small and *Q. succulenta* Small, of Florida, and *Q. fusiformis* Small, of central Texas, are shrubby Live oaks not known to form trees.

32. ARIZONA WHITE OAK — *Quercus arizonica* Sargent

This is the most abundant White oak in southern New Mexico and Arizona, and occurs in adjacent Mexico. It grows at altitudes of 1500 to 3000 meters, and attains a maximum height of 18 meters, with a trunk diameter of 1.2 m.

The branches are stout, spreading horizontally and more or less ascending, forming a usually symmetrical round-topped tree. The bark is about 2.5 cm. thick, deeply and narrowly fissured into wide ridges, which are broken into long thick plates of a light gray color; that of younger stems is much thinner, with close thin scales. The twigs are stout, woolly at first, becoming less hairy, finally smooth and reddish brown. The leaves are oblong to ovate or obovate, 2 to 8 cm. long, sharp or slightly rounded at the apex, rounded or heart-shaped at the base, entire or wavy, or sometimes spinose-toothed toward the apex, thick and somewhat revolute on the margin; they are thick, stiff, rather dark green and smooth, or covered with stellate hairs, and with a yellowish midrib above, yellow-green or pale green and thickly yellowish-hairy, with a broad thick yellow midrib and slender, coarsely netted venation beneath, persistent until the new leaves begin to unfold. The leaf-stalk is stout, slightly flattened, woolly, 4 to 8 mm. long. The flowers appear in April or May, the staminate in slender hairy catkins 4 to 5 cm. long, their calyx having 4 to 7 broad, sharp-pointed, yellow lobes; stamens exserted, their anthers oblong, notched, red or yellow. The pistillate flowers are on short hairy stalks, their involucre scales broadly ovate, hairy; styles short and spreading. The fruit, ripening late in the autumn of the first season, is sessile or short-stalked, solitary or 2 or 3 together; nut oblong or oval, 2 to 2.5 cm. long, brown and shining, often striped, cup hemispheric, 12 to 15 mm. across, light brown and hairy inside, embracing about one fourth of the nut, covered by close, ovate scales, which are densely coated with pale woolly hairs, those toward the base of the cup thickened.



FIG. 268. — Arizona White Oak.

The wood is hard and strong, close-grained, dark brown to nearly black. It

is very heavy, its specific gravity being a trifle over 1.00. It checks badly on drying, is very difficult to split and is utilized only as fuel.

33. NET LEAF OAK — *Quercus reticulata* Humboldt, Bonpland & Kunth

In Mexico this tree attains much greater dimensions than in our area, wherein it occurs in the mountains of southern New Mexico and Arizona, seldom attaining a height of 9 meters, with a trunk diameter of 3 dm., but is usually a shrub.

The bark is about 6 mm. thick, close, thin, scaly, of various shades of brown. The twigs are stout, densely hairy at first, becoming less so, orange colored, ultimately light brown. The winter buds are ovoid, 3 mm. long, reddish or brown.



FIG. 269. — Net Leaf Oak.

The leaves are broadly obovate or oblong-obovate, 3 to 12 cm. long, blunt, rounded or sometimes sharp-pointed at the apex, heart-shaped or sometimes rounded at the narrowed base, somewhat toothed above the middle with sharp or bristle-tipped teeth or entire, the margin slightly revolute; they are thick, firm, and stiff, dark green with scattered hairs but shining when old above, paler and thickly hairy with stout midrib and prominently reticulate venation beneath, persistent until the new leaves form; the petiole is stout, 5 to 10 mm. long. The flowers appear from April to June, the staminate in clusters of a few hairy catkins about

3 cm. long; calyx 5- to 7-lobed, hairy and yellow; stamens exserted, their anthers oblong, notched, smooth and yellow. The pistillate flowers are in spike-like clusters on long stalks which, like the involucre scales, are woolly; styles short, spreading, and dark red. The fruit is in spikes or only 2 together, rarely solitary; nut oblong, 12 to 15 mm. long, hairy at the apex; cup deeply saucer-shaped or hemispheric, 10 to 12 mm. across, dark brown and hairy inside, embracing one fourth to one third of the nut, covered by ovate, bluntish, hairy scales.

The wood is hard, close-grained and brown; its specific gravity is about 0.95.

34. EMORY'S OAK — *Quercus Emoryi* Torrey

An elegant tree of the mountains of southwestern Texas, New Mexico, Arizona, and adjacent Mexico, attaining a maximum height of 21 meters, with a trunk diameter of 1.5 m. in the cañons, but on the higher mountain sides reduced to a shrub. It is also called Black oak.



FIG. 270. — Emory's Oak, near Graham, Socorro Co., N. M.

The branches are stout, stiff, the lower somewhat pendulous, forming a broad round tree. The bark is up to 5 cm. thick, deeply fissured into long thick plates, covered with dark brown to black scales. The twigs are slender, stiff, and downy, becoming brown and less hairy, finally smooth and reddish brown or black. The buds are ovoid, sharp-pointed, about 6 mm. long, their scales brown with hairy tips. The leaves are oblong to lanceolate, 2.5 to 7 cm. long, sharp and bristle-pointed, heart-shaped, or rarely rounded at the somewhat narrowed base, entire or sparingly broadly toothed with bristle-tipped teeth on the revolute margin;

they are thick, stiff and leathery, dark green, very shining, smooth or slightly hairy with raised midrib above; paler, dull, smooth or hairy, at least along the prominent midrib, and obscurely net-veined beneath, persistent until spring when the new leaves begin to unfold.



FIG. 271. — Emory's Oak.

The leaf-stalk is stout and slightly hairy, 2 to 5 mm. long. The staminate flowers are in hairy catkins 5 to 7.5 cm. long; their calyx, which is 5- to 7-lobed, is hairy and light yellow. The pistillate flowers are sessile or on stout hairy stalks, the involucre also hairy; styles slightly spreading. The fruit ripens from July to September of the first season, is sessile or nearly so; nut oblong or narrowly ovoid, 12 to 20 mm. long, dark brown when ripe, the

apex hairy; shell thin, white downy inside; cup hemispheric, 10 to 12 mm. across, hairy inside, embracing about one third of the nut, its scales ovate, pointed, light brown and hairy.

The wood is rather soft, strong but brittle, close-grained, dark brown; its specific gravity is about 0.93. The sweet nuts are of commercial importance to the Indians and Mexicans of our southern border, where they are sold for food in the markets under the name of biotis.

35. TEXAN WHITE OAK — *Quercus breviloba* (Torrey) Sargent

Quercus obtusifolia breviloba Torrey. *Quercus Durandii* Sargent, not Buckley

Usually a shrub, this oak sometimes becomes a tree 9 meters tall, with a trunk diameter of 4 dm. It grows in limestone soil in central and western Texas and adjacent Mexico, and as a shrub forms dense thickets. It is also called White oak, Pin oak, and Shin oak.

The trunk is usually divided very near the base into several principal branches. The bark is about 6 mm. thick, grayish white or gray-brown, separating into thin, loose elongated scales. The twigs are slender, hairy, becoming smoother and gray. The buds



FIG. 272. — Texan White Oak.

are broadly ovoid, bluntish-pointed, about 1.5 mm. long and bright brown. The leaves are obovate or broadly oblanceolate, 4 to 12 cm. long, shallowly 3 to 7-lobed, the apex blunt or notched, tapering or wedge-shaped at the base, rather thin, dark green or bluish, shining, with raised pale narrow midrib above, densely finely hairy and silvery gray beneath, persistent until just before the new leaves unfold; the leaf-stalk is 4 to 10 mm. long. The flowers appear in March or April, the staminate in short hairy catkins, their calyx hairy and yellow, its lobes short and broad; stamens 5 to 7, exserted, their anthers broadly oblong, notched, smooth and yellow. The pistillate flowers are on short woolly stalks, their involucrel scales hairy; styles short, spreading and dull red. The fruit is sessile or nearly so; nut oblong, 10 to 15 mm. long; cup saucer-shaped, 10 to 15 mm. across, embracing about one fourth to one third of the nut, the scales close.

The wood is hard and strong but brittle, close-grained and brown.

It has been confused with Durand's oak, from which it differs in its broader, usually more lobed and longer persistent leaves, and in the deeper cup of the acorn. The older binomial *Quercus San Sabæana* Buckley may be the proper name for this tree.

36. MACDOUGAL'S OAK — *Quercus pauciloba* Rydberg

This little known species is reported only from central Arizona, where it grows in rich soil along the banks of streams and attains a height of 5 meters.

It has light gray bark, somewhat hairy, light brown to gray twigs, and small brown buds.

The leaves are oval, ovate or rarely obovate in outline, 5 to 8 cm. long; the 5 to 7 lobes are triangular-ovate, blunt or sometimes bristle-pointed or slightly toothed; the sinuses are broad, rather deep, rounded at the bottom; the base is broad, rounded, or slightly heart-shaped. They are firm, pale, bluish green, dull, and



FIG. 273. — MacDougal's Oak.

fine hairy above, pale brownish, slightly hairy and finely reticulated beneath. The fruit, ripening the first season, is stalked; nut ellipsoid or short-oblong, about 15 mm. long; cup hemispheric, 12 to 18 mm. across, embracing about one half of the nut and covered by ovate tapering white-hairy corky scales.

37. SHIN OAK — *Quercus undulata* Torrey*Quercus grisea* Liebmann

This shrub occasionally becomes a small tree and is distributed from eastern Colorado to western Texas, Nevada, New Mexico and Arizona, extending southward into Mexico. It is also called Scrub oak and Switch oak.

The bark is gray and flaky. The twigs are yellowish green and downy at first, becoming brown or gray. The buds are small, blunt and brown. The leaves are oval to oblong or oblong-lanceolate, 2 to 5 cm. long, blunt or pointed, entire or wavy, or toothed on the revolute margin. They are persistent, pale bluish green, hairy at first, becoming smooth and shining above, paler and mostly densely dull yellowish downy beneath; the leaf-stalk is about 5 mm. long. The tree flowers in Texas in April; the staminate catkins are hairy, 3 to 4 cm. long, the calyx-lobes oblong, the anthers short-oblong, smooth, on filiform filaments. The fruit ripens in the first season; nut oblong, about 1.5 cm. long, blunt or sharp-pointed; cup saucer-shaped to hemispheric, 12 mm. across, embracing one fourth to one third of the nut and covered by ovate corky thickened scales.



FIG. 274. — Shin Oak.

Mohr's oak, *Quercus Mohriana* Buckley, usually a shrub, of southwestern Texas and adjacent Mexico, is sometimes arborescent and 4.5 meters tall. It differs from the above described species in its large, relatively narrower leaves, which are light gray downy and not yellowish beneath. The nut is relatively thicker and the cup more hemispheric.

Quercus pungens Liebmann, is a shrub with crisped spiny-toothed leaves ranging from Colorado and western Texas to Arizona, California, and northern Mexico.

Quercus turbinella Greene, is a shrub ranging from New Mexico to Lower California, with small acorns and small toothed or entire leaves, hairy beneath.

38. BLUE OAK — *Quercus oblongifolia* Torrey

A native of western Texas, southern New Mexico, Arizona, and adjacent Mexico, attaining a maximum height of about 9 meters, with a trunk diameter of 6 dm. It is often called White oak.

The branches are numerous, rather stout, spreading and ascending, often forming a beautiful round-topped tree. The bark is up to 3 cm. thick, broken into small close light gray scales. The twigs are slender and stiff, slightly hairy,

becoming smooth, red-brown to light gray. The buds are oblong, blunt, brown, hairy at first. The leaves are oblong to ovate or oblanceolate, 3 to 6 cm. long, blunt at the apex, entire or seldom wavy or spiny-toothed on the revolute margin; they are firm, bright bluish and shining with prominently rounded midrib above, pale and finely reticulate veined beneath, persisting during the winter and turning yellow before falling at about the time the new leaves unfold. The leaf-stalk is stout, about 3 mm. long. The flowers appear in March or April with the unfolding leaves, the staminate in few slender, woolly catkins about 4 cm. long, their calyx of 4 or 5 sharp-pointed, yellow lobes; stamens exserted, their anthers oval, notched, smooth and yellow. The pistillate flowers are sessile or on short hairy stalks; involucre woolly; styles slightly spreading and light red. The fruit, ripening in the autumn of the first season, is sessile; nut ellipsoid or somewhat ovoid, 12 to 15 mm. long, brown and shining, its shell very thin; seed dark purple and very astringent; cup hemispheric, 1 to 1.5 cm. across, embracing about one third of the nut, covered by very hairy, corky-thickened, brownish margined scales.



FIG. 275.—Blue Oak.

The wood is hard, strong but brittle, very dark brown and heavy. It checks badly on drying, is hard to cut or split, and is only used for fuel.

39. ENGELMANN'S OAK — *Quercus Engelmanni* Greene



FIG. 276.—Engelmann's Oak.

This evergreen oak occurs over a limited area of southwestern California, from Kern county to San Diego county, where it attains a maximum height of 18 meters, with a trunk diameter of 9 dm. It is also known as Live oak and Evergreen white oak.

The branches are stout, the lower horizontally spreading, forming a broad tree. The bark is up to 5 cm. thick, deeply but narrowly fissured into broad ridges, with flaky close brownish gray scales. The twigs are stout, stiff and hairy, soon becoming quite smooth, reddish brown and finally brown or gray. The leaves are oblong to obovate,

2.5 to 7 cm. long, blunt and rounded, or seldom sharp-pointed at the apex, rounded or heart-shaped at the base, entire, slightly wavy, or rarely toothed on the margin; they are thick and firm, bluish green, smooth or slightly hairy, with a yellowish midrib above, yellowish green, covered with brownish hairs, but becoming smooth, with prominent venation beneath when old, persistent until the new leaves appear; the leaf-stalk is slender, hairy, 6 to 12 mm. long. The flowers open in April or May in clustered numerous slender hairy catkins 5 to 7.5 cm. long, their calyx slightly hairy and yellow; stamens exserted, their anthers oblong, slightly notched, smooth and yellow. The pistillate flowers are on slender stalks, their involucre scales broad and hairy; styles short, broad and spreading. The fruit, ripening the first season, is usually short-stalked; nut oblong or oval, 18 to 25 mm. long, dark brown and striped, soon becoming lighter colored; cup deeply saucer-shaped or top-shaped, 12 to 18 mm. across, light brown and hairy inside, embracing about one third of the nut, covered by ovate brownish pale woolly scales, those at the base of the cup thickened.

The wood is hard, strong but brittle, close-grained, dark brown; its specific gravity is about 0.94. It checks badly on drying, and is probably used only for fuel.

A probable hybrid with *Q. dumosa* is reported.

40. TOUMEY'S OAK — *Quercus Toumeyi* Sargent

This small-leaved, little known oak occurs, in so far as known, only in Arizona, where it attains a height of 10 meters, with a trunk diameter of 2 dm.



FIG. 277. — Toumey's Oak.

The short trunk forks into several widely-spreading branches. The bark is 18 mm. thick, deeply furrowed, dark reddish brown with thin close scales. The twigs are slender, reddish and hairy, becoming dark brown to nearly black. The leaves are oblong, ovate-oblong to oval, 1.5 to 2 cm. long, sharp and bristle-pointed, rounded or heart-shaped at the base, entire or sometimes slightly bristle-toothed on the somewhat revolute margin; they are firm, bluish green, smooth and shining, with slender raised midrib above, short hairy and finely reticulate-veined beneath, persisting until the new leaves form; the leaf-stalk is stout and woolly, about 2 mm. long. The fruit is sessile, solitary or two together, ripening in early summer of the first year; nut narrowly

ovoid, 12 to 18 mm. long, bright brown and shining, the apex hairy; cup saucer-shaped depressed-hemispheric, about 10 mm. across, bright brown and hairy in-

side, thin and embracing about one fourth of the nut, covered by thin, ovate, imbricated hairy scales not corky-thickened on the back.

The wood is hard, close-grained and light brown.

41. CALIFORNIA ROCK OAK — *Quercus Douglasii* Hooker and Arnott

A tree of dry hills and mountain sides of west central California, southward to Kern county, attaining a maximum height of 36 meters, with a trunk diameter of 1.2 meters, but often reduced to a shrub in its southern range.

The branches are short and stout, the lower widely spreading, the tree usually round-topped and broad. The bark is up to 2.5 cm. thick, pale gray or nearly white, and somewhat scaly. The twigs are stout, very brittle, softly woolly during the first season, becoming less hairy, gray or brown, finally smooth. The winter buds are ovoid, blunt, 3 to 6 mm. long, reddish and hairy. The leaves are very variable, oblong, oval or obovate, 5 to 12.5 cm. long, pointed or rounded at the apex, narrowly or broadly rounded, or heart-shaped at the base; the 4 to 7 lobes are broad or narrow, sharp-pointed, bristle-tipped or rounded, the sinuses deep or shallow, acute or rounded at the bottom; they are sometimes entire except for a few teeth toward the apex, thin, but firm and stiff, bluish green with scattered hairs and raised rounded midrib above, paler or yellowish green, softly hairy and more or less conspicuously reticulate veined beneath. They fall in the late au-



FIG. 278. — California Rock Oak.

umn; the leaf-stalk is stout, grooved, 6 to 12 mm. long. The flowers appear from February to May. The staminate catkins are hairy, about 3 cm. long; calyx hairy, deeply lobed and yellowish green; stamens exserted, their anthers oblong, notched, smooth and yellow. The pistillate flowers are solitary or several together; involucre hairy; styles short and spreading. The fruit is sessile or short-stalked, often produced in great profusion; nut broadly oval to ovoid, 18 to 30 mm. long, brown and shining; cup nearly hemispheric, light green and hairy inside, embracing about one fourth of the nut, covered by small, hairy scales with sharp tips.

The wood is hard, strong but brittle, close-grained, dark brown; its specific gravity is about 0.89; it checks badly and is little used except for fuel.

This is one of the most beautiful of the California oaks. It is also called Mountain white oak, Rock oak, White oak, Hill oak, and Blue oak.

Quercus alvardiana Eastwood, a recently described and little known small tree or shrub of the southern end of the San Joaquin Valley, California, has very long and slender acorns.

42. DURAND'S OAK — *Quercus Durandii* Buckley

A tree of dry but rich soil of river valleys from central Alabama to Texas, reaching a maximum height of 16 meters, with a trunk diameter of 1 m.

The bark is about 2 cm. thick, slightly scaly and light gray. The twigs are

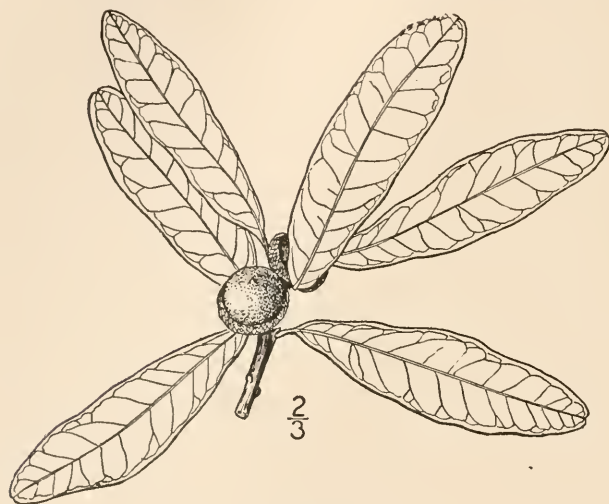


FIG. 279. — Durand's Oak.

slender and woolly, becoming less hairy and dark gray. The winter buds are small, oval and bright brown. The abundant leaves are narrowly oblong, 4 to 10 cm. long, entire or but slightly 5-lobed toward the blunt or somewhat notched apex, broadly tapering or wedge-shaped at the base; they are thick and somewhat leathery, bright green and shining above, very pale and whitish hairy beneath, turning pale yellow and fall in the autumn.

The leaf-stalk is stout, grooved, about 5 mm. long. The staminate flowers are in short, hairy catkins; calyx pale yellow with broad lobes; stamens 5 to 7, exserted, their anthers large, broad, notched, smooth and yellow. The pistillate flowers are on short, hairy stalks; scales hairy; styles short, spreading and red. The fruit ripens at the end of the first season, and is nearly sessile; nut ovoid or somewhat depressed, about 1 cm. long; cup saucer-shaped, 10 to 12 mm. across, rather thin, embracing only the base of nut, covered by thin, close, sharp-pointed, whitish-woolly scales.

The wood is said to equal white oak and is used as such. Locally it is prized for certain portions of cotton gins and is also used in the manufacture of wagon wheels, hubs, spools, and split baskets.

It is a very beautiful tree and has been confused with the Texan white oak, *Q. breviloba* (Torrey) Sargent, of central and western Texas.

43. LACEY'S OAK — *Quercus Laceyi* Small

A small tree with a maximum height of 6 meters but more often a shrub, of limestone hills in south central Texas, where it is called Bastard oak and Mountain oak.

The bark is brown, irregularly and deeply grooved. The twigs are slender, somewhat hairy, the buds small, blunt, their scales thick, red and hairy-margined. The abundant leaves are 4 to 8 cm. long, oblong, with 3 to 5 shallow lobes, or oblong-obovate and more prominently 3-lobed near the rounded or notched apex; the base is narrow, abruptly truncate or heart-shaped; they are thick, almost leathery, olive-green with a waxy appearance above, grayish and somewhat minutely scurfy with prominent yellowish venation beneath, persisting almost until the new leaves form. The leaf-stalk is short, stout, grooved and hairy. The fruit, ripening at the end of the first season, is sessile or nearly so; nut oblong to oblong-ovoid, 1.5 to 2 cm. long, often depressed at the apex, its shell thin, brown and smooth inside; cup shallow, saucer-shaped, 12 to 17 mm. across, light brown inside, rather thick, embracing only the base of nut, covered with stout, coarse, corky, brownish-downy scales.



FIG. 280. — Lacey's Oak.



FIG. 281. — Southern Oak.

44. SOUTHERN OAK
Quercus austrina Small

A rough barked tree of river borders in Georgia and Alabama, reaching a height of 15 meters, with a trunk diameter of 1 m. It is also called Pin oak and Bastard oak.

The twigs are smooth, reddish and glaucous. The winter buds are about 2 mm. long, dark brown, with hairy pointed scales. The leaves are wedge-

shaped or oblong-wedge-shaped, 5 to 15 cm. long, bluntly 3- to 5-lobed above the middle, the apex rounded, base tapering or narrowly rounded; they are light green but dull with reddish brown midrib above, whitish woolly, soon becoming quite smooth and somewhat glaucous with prominent brown venation beneath; the leaf-stalk is very short and stout. The staminate catkins are 5 to 7 cm. long and very slender; calyx hairy; stamens exserted, the anthers notched. The fruit ripens in the autumn of the first season. The nut is 1.5 to 2 cm. long; cup hemispheric.

45. CHAPMAN'S OAK — *Quercus Chapmani* Sargent

Quercus obtusiloba parvifolia Chapman

Usually a shrub of sandy pinelands near the coast from South Carolina to Florida; it is most abundant on the western coast of Florida, and sometimes becomes a tree 10 meters tall, with a trunk diameter of 3 dm.

The branches are stout, the tree usually round-topped. The bark is about



FIG. 282. — Chapman's Oak.

5 mm. thick, broken into thin flattish scales of a grayish black color. The twigs are slender, densely covered with yellowish hairs, soon becoming nearly smooth and brown to gray. The buds are ovoid, sharp or blunt-pointed, brown, about 3 mm. long. The leaves are obovate to oblong, 5 to 10 cm. long, blunt at the apex, narrowed or wedge-shaped or broad and rounded at the base; the somewhat revolute margin is wavy or often shallowly 3-lobed near the apex; they are rather thick and nearly leathery, dark green, smooth and shining above, lighter green or whitish and persistently hairy beneath, usually falling off during the winter, sometimes persisting until the new foliage forms.

The leaf-stalk is very short. The flowers appear when the leaves are about one third unfolded or later, the staminate in hairy catkins 3 to 5 cm. long, their calyx hairy, the 5 lobes toothed; stamens exserted, their anthers broad, notched and hairy. The pistillate flowers are sessile or nearly so; involucre and calyx densely woolly; styles short, stout and spreading. The fruit, ripening the first season, is usually sessile, solitary or 2 together; nut oblong or elliptic, 1.5 to 2.5 cm. long, light brown, slightly hairy near the apex; cup depressed-hemispheric, 1.5 to 2 cm. across, light brown, slightly hairy inside, embracing nearly one half of the nut and covered by thick hairy scales.

The wood is moderately hard, close-grained and yellowish brown.

46. CHINQUAPIN OAK — *Quercus prinoides* Willdenow

This spreading shrub is of wide distribution from Maine to Minnesota, North Carolina, Alabama, and Texas; it sometimes becomes tree-like and 5 meters tall, with a trunk diameter of 1.25 dm. It is also called Scrub chestnut oak and Dwarf chinquapin oak.

The light brown bark is scaly. The twigs are slender, dark reddish green and scurfy, soon becoming smooth, passing through various shades of brown to dark brown. The winter buds are ovoid to subglobose, usually blunt, about 3 mm.

long and brown. The leaves are obovate, oblanceolate to obovate-oblong, 0.5 to 1.5 dm. long, mostly sharp-pointed at the apex, narrowed or rounded at the base, coarsely wavy toothed; they are thin and firm, dark yellowish green, smooth and faintly shining above, grayish and finely hairy beneath, the midrib narrow and yellow; they turn bright scarlet to yellow before falling in the autumn; the leaf-stalk is stout, nearly smooth, flattened and grooved, 5 to 15 mm. long. The flowers appear in May or June when the leaves are unfolding, the staminate in hairy catkins 4 to 6 cm. long; calyx 4- to 9-lobed, yellowish green and hairy; stamens much exserted, their anthers notched, yellow and smooth. The pistillate flowers are whitish hairy, the styles



FIG. 283. — Chinquapin Oak.

very short and broad-spreading, light red. The fruit, ripening in the autumn of the first season, is produced in great abundance, sessile or nearly so; nut oblong to ovoid, 1.5 to 2.5 cm. long, hairy near the apex, light brown and shining, its seed sweet; cup hemispheric, 13 to 18 mm. across, thin and embracing nearly one half of the nut, covered by ovate, sharp-pointed hoary scales.

The wood is too meager to be of economic value except for fuel.

As a shrub it affords variety to plantations by its abundant fruit and beautiful autumnal coloration. The very recently described *Q. prinoides rufescens* Rehder, a shrub ranging from Nantucket to New Jersey, is a form with some yellowish hairs on twigs and leaves.

47. YELLOW OAK — *Quercus Muhlenbergii* Engelman

Quercus Prinus acuminata Michaux. *Quercus acuminata* Houba

This beautiful oak grows from Vermont to Minnesota, Florida and Texas, usually in limestone soils, reaching a maximum height of 48 meters, with a trunk

diameter of 2.5 m.; in its northeastern range it scarcely exceeds one third these dimensions.

The trunk is tall and straight, often widely buttressed at the base. The branches are relatively small, and the tree usually round-topped. The bark is up to 5 cm. thick, close, rough, broken into gray or sometimes brownish scales. The twigs are slender, reddish green and hairy, becoming smooth and passing through various shades of brown to gray-brown. The buds are ovoid, sharp-pointed, 3 to 5 mm. long, covered with brown scales. The leaves are crowded toward the ends of the branches, oblong, lanceolate or sometimes obovate, 0.5 to 2 dm. long,



FIG. 284. — Yellow Oak.

usually taper-pointed, generally narrow and wedge-shaped, or seldom slightly rounded or heart-shaped at the base, coarsely toothed; they are thick and rather firm, bright green, smooth and shining, with impressed yellowish midrib above, pale or often nearly white, more or less hairy and conspicuously veined beneath, turning orange and scarlet before falling in the autumn; the leaf-stalk is slender, round or slightly flattened, 1 to 3 cm. long. The flowers appear with the leaves in spring; the staminate catkins 7.5 to 10 cm. long, their calyx-lobes fringed, yellowish; stamens numerous, their anthers oblong, slightly notched, smooth and yellow. The pistillate flowers are sessile, often spicate, thickly covered with white downy hairs; styles short, broad, spreading and light red. The fruit, ripening in the first autumn, is sessile or nearly so, solitary or 2 together; nut ovoid, about 1.5 to 2 cm. long, brown; seed sweet and edible; cup hemispheric, 13 to 18 mm. across, brown and hairy inside rather thin, embracing about one half the nut, covered by scales with thickened bases, and brownish tips often forming a fringe around the rim.

The wood is hard, very strong, close-grained; its specific gravity is about 0.86. It is rather difficult to season, but is used for fencing, railroad ties, and barrels.

This tree should be seen more frequently in parks and on lawns, to which its handsome form and foliage would add additional beauty.

It is also called Yellow chestnut oak, Chinquapin scrub oak, Dwarf chestnut oak, Scrub oak, White oak, Rock oak, Pin oak and Narrow-leaved chestnut oak.

48. ALEXANDER'S OAK — *Quercus Alexanderi* Britton

This relative of the Yellow oak has long been confused with that species, which it resembles in general appearance but differs in its flaky bark and usually broader leaves. It occurs in rich bottom lands and is known from Vermont to

Michigan and from Ohio and Indiana. Most of the common names of the Yellow oak are probably applied to this tree also.

The bark is flaky, scaly and gray. The smooth twigs are yellowish brown, becoming gray. The leaves are obovate or oblong-obovate, broadest above the middle, the margin coarsely and bluntly or sharply toothed, the apex taper-pointed, the base tapering or rounded; they are thin but firm, yellow-green and smooth above, paler, smooth or slightly hairy, with straw-colored prominent venation beneath, turning bright yellow before falling in the autumn; the leaf-stalk is slender, 2 to 3 cm. long, thickened and darkened at the base. The fruit ripens the first autumn, is sessile, or very short-stalked; nut ovoid, 1.5 to 2 cm. long, light brown, hairy at the apex; cup deeply saucer-shaped, 12 to 15 mm. across, light brown and roughish inside, thin, embracing one third to one half the nut and covered with small, thick, grayish-hairy scales.

The wood is similar to that of the Yellow oak and used indiscriminately as such.

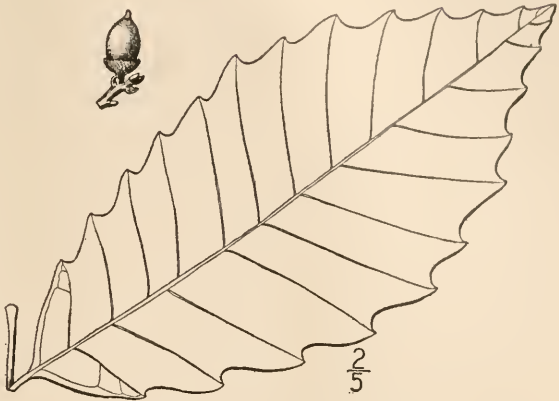


FIG. 285. — Alexander's Oak.

49. ROCK CHESTNUT OAK — *Quercus Prinus* Linnæus

A tree usually of sterile hillsides from Maine to Ontario, south to New Jersey, Virginia, and in the mountains to Georgia, Alabama and Tennessee, reaching a maximum height of 30 meters, with a trunk diameter of 2 m.



FIG. 286. — Rock Chestnut Oak.

The trunk is usually divided rather low down into several principal branches, the tree, when not crowded, sometimes broader than high. The bark is up to 5 cm. thick, deeply fissured into thick roughish ridges of a brown to nearly black color; on younger stems it is thinner, quite smooth, brownish and somewhat shining. The twigs are stout, purplish green, usually smooth, passing through various shades of brown to gray or dark brown. The winter buds are ovoid, sharply taper-

pointed, 5 to 10 mm. long, and light brown. The leaves are oblong, oblong-lanceolate, or obovate, 1.5 to 2 dm. long, sharp, sometimes taper-pointed, or rarely rounded at the apex, variously wedge-shaped, rounded or heart-shaped at the base, margined with coarse rounded teeth. They are thick, almost leathery, dark green, smooth and slightly shining, with impressed yellowish midrib above, pale grayish, finely hairy and prominently veined beneath, turning dull orange or yellow-brown before falling in the autumn; the leaf-stalk is short and slender, 1 to 3 cm. long. The flowers appear in spring when the leaves are about one third unfolded, the staminate in hairy catkins 5 to 7 cm. long; calyx pale yellow, deeply 7- to 9-lobed; stamens little exerted, their anthers broadly oblong, notched, smooth and yellow. The pistillate flowers are few together on stout slightly hairy stalks; involucre pale hairy; styles very short, broad, spreading, and reddish. The fruit is on stout short stalks, solitary or in pairs; nut ovoid or oblong-ovoid, 2.5 to 3.5 cm. long, light brown and shining; seed insipid but edible; cup hemispheric, 1.2 to 3.5 cm. across, light brown and hairy inside, thin, embracing about one third of the nut, covered by rather small thin-tipped scales with thickened bases, smallest near the rim.

The wood is hard, strong, tough, close-grained and dark brown; its specific gravity is about 0.75. It cures with difficulty, is quite durable in the soil, and is used for railroad ties, fencing, and for fuel. The bark is used in tanning, being valued next to that of the White oak for this purpose.

It is also known as Chestnut oak, Rock oak, Tanbark oak, Swamp chestnut oak, and Mountain oak.

50. BRAY'S OAK — *Quercus Brayi* Small



FIG. 287. — Bray's Oak.

A rather large tree, occurring in cañons of central Texas, where it is called White oak and attains a height of 20 meters.

The bark is pale and flakes off easily. The leaves are cuneate-obovate, 1 to 2 dm. long, abruptly taper-pointed, tapering at the base; the slightly revolute margin is coarsely wavy-toothed nearly to the base; they are thin, deep green, smooth with impressed midrib above, somewhat paler beneath, with prominent whitish midrib and relatively few strong regular prominent lateral veins; they are numerous and fall off at the end of the first season; leaf-stalk 1.5 to 2.5 cm. long, short, thickened at the base. The fruit ripens at the end of the first season, and is short-stalked; nut oblong to ovoid, 2.5 to 3 cm. long, brown and smooth with a sweetish

seed; shell thin; cup hemispheric, 2 to 2.5 cm. across embracing about one third of the nut, covered by numerous small ovate, somewhat warty scales.

51. COW OAK — *Quercus Michauxii* Nuttall

This magnificent tree inhabits moist soils along streams and swamp borders, from Delaware to northern Florida, westward to Indiana, Missouri and Texas, attaining a maximum height of 35 meters, with a trunk diameter of 2 m. It is also known as Basket oak, Swamp oak, and Swamp chestnut oak.

The straight trunk is often free of branches for half its height. The branches are stout and ascending, the crown of old trees usually round-topped. The bark is up to 2.5 cm. thick, separating into very thin flaky plates of a nearly white or reddish gray color. The twigs are stout, dark green and hairy, soon becoming smooth, light reddish or orange-brown, and finally gray. The buds are ovoid or oval, 6 mm. long, sharp-pointed and dark red. The leaves are obovate or broadly oblong, 10 to 20 cm. long, sharp or short taper-pointed, wedge-shaped or narrowly rounded at the base, coarsely round-toothed, slightly shining with the midrib impressed above, pale, densely covered with short hairs and prominently veined beneath, turning dark reddish before falling in late autumn; the leaf-stalk is stout, flattened, channelled, 1 to 3 cm. long. The flowers appear when the leaves are about half unfolded in April or May, the staminate in slender, hairy catkins 7.5 to 10 cm. long; calyx minutely hairy, yellow-green, 4- to 7-lobed; stamens up to 7, their anthers broadly oblong, slightly notched, smooth, and yellow. The pistillate flowers are few or several, spicate, their involucre brownish hairy; styles short, broad, spreading, and dark red. The fruit ripens the first autumn, is solitary or 2 together on short stalks; nut oblong to ovoid, 3 to 3.5 cm. long, bright brown, somewhat shining, its seed sweet and edible; cup deeply saucer-shaped, 2.5 to 3.5 cm. across, reddish brown and hairy inside, thick, embracing about one third of the nut, covered by large, broad, hairy, often thickened scales forming a fringe around its rim.

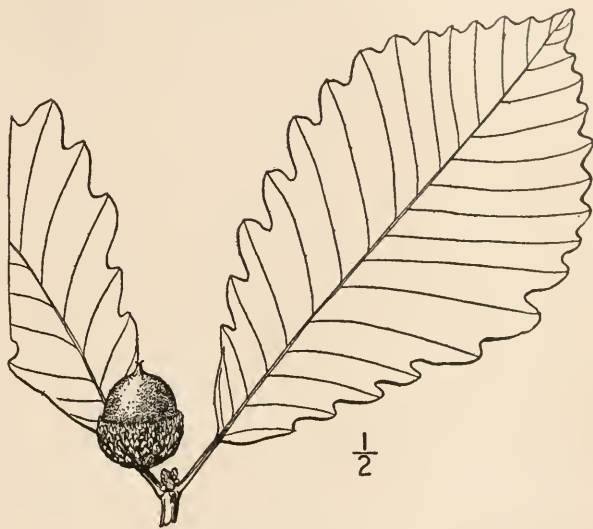


FIG. 288. — Cow Oak.

The wood is very hard, strong and tough, close-grained, lightish brown; its specific gravity is about 0.80. It is quite durable in contact with the soil and is used to a large extent as White oak in the southeastern States for general construction, agricultural implements, cooperage, and as it splits easily, it is much

used to make split baskets, also for fencing and fuel. The sweet fruit is largely eaten by children, negroes, and various animals.

It is the handsomest of the Chestnut leaved oaks and deserves extensive planting as a very ornamental shade tree in moist situations southward.

A cross with the Bur oak, *Q. macrocarpa* Michaux, is reported from near Covington, Tennessee.

52. SWAMP WHITE OAK — *Quercus bicolor* Willdenow

Quercus Prinus platanoides Lambert. *Quercus platanoides* Sudworth

The Swamp oak, as it is also called, is a majestic tree of rich soils along streams and swamps from Maine and Quebec to Michigan, southward to Georgia and Arkansas, attaining a maximum height of 36 meters, with a trunk diameter of 2.5 m. It is occasionally called Blue oak.

The trunk is tall and straight, more or less buttressed at the base. The lower branches are stout, horizontal or often drooping; the tree, when not crowded, sometimes wider than high. The bark is up to 5 cm. thick, deeply fissured into nearly flat, usually confluent ridges, covered by close gray-brown or red-brown scales; on younger stems it is smooth, reddish to brown, and separates into thin large plates which peel off much as in the Sycamore tree. The twigs are stout, green, slightly hairy and shining, becoming smooth or nearly so, and passing through various shades of brown to dark brown or purplish, often somewhat glaucous. The winter buds are broadly ovoid to oval, blunt or sharp-pointed, about 3 mm. long and brown. The leaves are obovate or oblong-obovate, 0.5 to



FIG. 289. — Swamp White Oak.

2 dm. long, pointed or rounded at the apex, narrowed and usually wedge-shaped at the base, coarsely round-toothed, sometimes almost lobed; they are rather thick, deep green and somewhat shining, with stout rounded pale midrib above, pale or nearly white, downy and prominently veined beneath, turning dull yellowish or orange-brown before falling late in the autumn; the leaf-stalk is 1 to 3 cm. long, stout, flattened and grooved. The flowers appear in April or May, the staminate in clustered numerous slender hairy catkins 5 to 7 cm. long; calyx yellowish green, hairy, 5- to 9-pointed; stamens slightly exserted; anthers oblong, notched, smooth and yellow. The pistillate flowers are in spikes on long white-woolly peduncles; involucre thick, white and woolly; styles very short, broad and spreading, bright red. The fruit ripens the first autumn, solitary or 2 together on long slender brown peduncles 2.5 to 10 cm. long; nut oblong or oblong-ovoid, 2 to 3 cm. long,



FIG. 290. — Swamp White Oak, near Giffords, Staten Island.

usually pale hairy at apex and light brown; seed sweetish; cup deeply saucer-shaped to depressed hemispheric, 2 to 2.5 cm. across, light brown and hairy inside, thick, embracing about one third of the nut, covered with thick woolly, often tuberculate scales, the upper ones thinner and narrower, sometimes forming a fringe around the rim.

The wood is hard, tough and strong, close-grained, light brown; its specific gravity is about 0.77. It is used as is White oak in construction, interior finishing, cabinet work, carriage and other wheels, implements, railroad ties, cooperage, fences, and for fuel. The tree thrives when planted in moist places.

53. BUR OAK — *Quercus macrocarpa* Michaux

Although one of the largest of American oaks this grows as a shrub in its most northwestern range; it inhabits rich bottom lands from Nova Scotia to Manitoba, Wyoming, Georgia and Texas, attaining a maximum height of 55 meters, with a trunk diameter of 2.5 m.



FIG. 291. — Bur Oak.

The trunk is tall, often free of branches in the forest for half its height. The lower branches are large and widely spreading; isolated trees are broad and round-topped. The bark is up to 5 cm. thick, deeply fissured into irregular plates of a brown or reddish color. The twigs are hairy, stout, soon becoming smooth, yellowish and finally dark brown, with corky wings often 4 cm. wide on some trees. The winter buds are ovoid, sharp-pointed or blunt, 3 to 5 mm. long, red-brown and finely hairy.

The leaves are obovate or spatulate in outline, 1 to 3 dm. long, the 5 to 7 lobes mostly diverging, the terminal lobe the largest and coarsely toothed, the middle sinuses usually broad and deep; sometimes, however, the leaf is only coarsely round-toothed; the apex is rounded or pointed, the base tapering; they are rather thin, dark green, smooth and shining above, finely white or grayish hairy beneath, turning yellow or yellowish brown before falling in the autumn; the leaf-stalk is thick, flattened and grooved, enlarged at the base, and 8 to 25 mm. long. The flowers appear from March to June, according to latitude. The staminate catkins are yellowish hairy, 1 to 1.5 dm. long; calyx-lobes 4 to 6, irregularly toothed, yellow-green and hairy; stamens 4 to 5, slightly exserted; anthers broadly oblong, notched and greenish yellow. The pistillate flowers are sessile or stalked; involucre scales broadly ovate, woolly, often reddish; styles short, broad, spreading and light red. The fruit, ripening in the autumn of the first season, is usually solitary and sessile, sometimes

stalked, or in clusters of 2 or 3, very variable as to size and shape; nut subglobose or broadly oblong, 2 to 5 cm. long, hairy at the apex; cup deeply hemispheric or subglobose, 2 to 5 cm. across, light brownish hairy inside, embracing one third to one half of the nut, the large scales ovate, pointed, the basal ones thick and tuberculate, the upper ones taper-pointed or prolonged into thread-like tips, often forming a deep fringe around the rim.

The wood is hard, strong and tough, close-grained, light or dark brown; its specific gravity is about 0.74. It is quite durable and is used in all kinds of construction work, cabinet work, and for all purposes for which White oak is used and from which it is not usually distinguished in commerce.

As a shade tree it is most useful as well as beautiful, as its resistance to smoke is greater than most other oaks. Its large size, however, requires that it be given ample space in which to develop.

It is also called Mossy cup oak, Overcup oak, Blue oak, Scrub oak, Overcup white oak, Mossy cup white oak. Supposed hybrids with *Q. Muhlenbergii* have been observed in Kansas and Missouri.

54. OVERCUP OAK — *Quercus lyrata* Walter

This beautiful oak is an inhabitant of river swamps or other wet soils that are frequently overflowed, from Maryland to Missouri southward to Florida and Texas, attaining a maximum height of 35 meters, with a trunk diameter of 1 m.

The trunk frequently divides into several principal branches or main stems, but is often tall and erect with stout lower horizontal branches. The bark is up to 2.5 cm. thick, fissured into thick plates which are thin-scaly and light or reddish gray. The twigs are slender, reddish green and hairy, becoming smooth, orange or gray brown, finally pale gray or light brown. The winter buds are ovoid, blunt, 3 mm. long, brown and slightly hairy. The leaves are obovate or spatulate in outline, 10 to 20 cm. long, lyrate pinnatifid into 5 to 9 lobes; the middle pair of sinuses are deep and broad at the bottom; the lobes near the apex are much longer than those below; the apex is pointed, the base usually wedge-shaped; they are smooth, green and shining above, pale, white hairy or green beneath, with a stout yellowish midrib and prominent venation, turning bright scarlet or orange before falling in the autumn; the leaf-stalk is stout, grooved, smooth or hairy, 5 to 20 mm. long. The flowers appear with the leaves in March or April, the staminate catkins slender and hairy, 10 to 15 cm. long; calyx-lobes sharp-pointed, hairy and light yellow;



FIG. 202. — Overcup Oak.

stamens slightly exserted, their anthers ovate, sharp-pointed, smooth and yellow. The pistillate flowers are hairy throughout; styles short, broad and spreading. The fruit ripens the first autumn, usually on short stalks; nut ovoid and exserted, or usually depressed globose and almost entirely enclosed in the cup, light brown and somewhat hairy; cup hemispheric or depressed-globose, 2 to 4 cm. across, bright reddish brown and hairy inside, covered with ovate pale-puberulent more or less united scales, with sharp tips; at the base of the cup these are much thickened, thinner and smaller toward the rim.

The wood is hard, strong and tough, close-grained, dark brown; its specific gravity is about 0.83. It is very durable and is used for the same purposes as that of the White oak from which it is not commercially differentiated.

It is also called Swamp overcup oak, Post oak, Swamp post oak, Swamp white oak, and Water white oak.

55. CALIFORNIA WHITE OAK — *Quercus lobata* Née

A characteristic tree, known only from California, where it occurs mainly in valleys of the western part of the State, reaching a maximum height of 30 meters, with a trunk diameter up to 3 m.

The trunk is often short and divided low down into several large limbs, with



FIG. 293. — California White Oak.

slender pendulous branches, whence the common name "Weeping oak," by which it is widely known; sometimes it is tall, however, with branches only above. The bark of moderately large trees is up to 4 cm. thick, scaly, orange or brown; at the base of the largest trees, however, it is often 15 cm. thick and fissured into flat plates. The twigs are slender, silky hairy at first, becoming nearly smooth and reddish brown. The buds are ovoid, sharp-pointed, about 5 mm. long, yellowish brown. The leaves vary in outline from ovate to obovate, the 6 to 9 lobes

vary much in shape, either notched or rounded at the apex, the sinuses deep and usually narrow at the bottom, the apex usually rounded, the base wedge-shaped, rounded or heart-shaped; they are thin and firm, dark green and slightly hairy above, pale and hairy beneath, with a stout midrib and prominent venation, falling off in the autumn; the leaf-stalk is broad, flattened and hairy, 6 to 12 mm.

long. The flowers appear from February to April, when the leaves are about one half unfolded. The staminate catkins are hairy, 5 to 7.5 cm. long; calyx-lobes 6 to 8, sharp-pointed, hairy and pale yellow; stamens exserted, oblong, notched, smooth and yellow. The pistillate flowers are usually solitary, stalkless; involucre scales broad and woolly; styles short, broad and spreading. The fruit ripens the first season, and is sessile or very nearly so; nut narrowly oblong-conic, rather hairy, 3 to 5 cm. long, its seed sweetish; cup depressed-hemispheric or saucer-shaped, 2 to 2.5 cm. across, pale hairy inside, embracing very little of the nut, covered with thick whitish-hairy scales, the uppermost thinner and more slender tipped than the lower.

The wood is quite hard but brittle, close-grained and light brown; its specific gravity is about 0.74. It is difficult to season properly and is scarcely ever used except for fuel. The nuts, which are usually abundant, are gathered and stored for food by the Indians.

It is also known as Valley oak, White oak, Swamp oak, and Roble.

56. MACDONALD'S OAK — *Quercus MacDonaldi* Greene

A tree of the islands off the coast of southern California where it grows along streams, reaching a height of 10.5 meters, with a trunk diameter of 4.5 dm. It is also called Island oak.

The bark is close and gray. The branches are numerous, forming a compact round head. The twigs are slender, densely hairy at first becoming nearly smooth. The winter buds are about 3 mm. long, oval and sharp-pointed. The leaves are spatulate-oblong or obovate, 5 to 7 cm. long; the 5 to 9 lobes are blunt or sharp-pointed and bristle-tipped, the lower portion narrow and entire, the narrowed base unequal; they are thick and firm, smooth above, densely hairy at first becoming less so and prominently reticulate beneath. The fruit ripens the first season, and is sessile; the nut is conic or oblong-conic, 2 to 4 cm. long, sharp-pointed; cup deeply hemispheric, embracing about one third of the nut and covered by thick tuberculate scales.



FIG. 294. — MacDonald's Oak.

Quercus dumosa Nuttall, with which this species has been confused, is a shrub with smaller leaves and acorns, widely distributed in California.

57. PACIFIC POST OAK — *Quercus Garryana* Douglas

This oak occurs from Vancouver island and southwestern British Columbia to central California, attaining a maximum height of 45 meters, with a trunk diameter of 1.5 m.; on high mountains or in exposed situations it is reduced to a shrub.

The branches are stout, spreading and ascending, forming a broad compact tree. The bark is up to 2 cm. thick, shallowly fissured into bluntish ridges



FIG. 295. — Pacific Post Oak.

covered with brown, gray or sometimes orange-brown scales. The twigs are stout, hairy, becoming smooth, reddish brown or gray. The winter buds are ovoid, sharp-pointed, about 1 cm. long and very woolly. The leaves are oblong-ovate in outline, 1 to 1.5 dm. long, the 7 to 9 lobes oblong, entire or wavy, rounded or pointed at the apex, the terminal one often 3-lobed; the base of the leaf is wedge-shaped or rounded, the margin revolute; they are thick,

quite leathery, dark green, smooth and shining above, light green or yellowish and hairy beneath, with stout yellowish midrib and conspicuous venation, often turning scarlet before falling in the autumn; the leaf-stalk is stout, hairy, flattened, 12 to 25 mm. long. The staminate flowers are in hairy catkins 4 to 5 cm. long; calyx-lobes smooth and sharply toothed; anthers broadly oblong, notched, smooth and yellow; the pistillate flowers are usually sessile, hairy; styles very short, broad and spreading. The fruit ripens the first season, is sessile or nearly so; nut oval or somewhat obovoid, about 2.5 cm. long, its seed sweet; cup depressed-hemispheric, 1.5 to 2 cm. across, light brown and hairy inside, covered with long-tipped, thin or slightly thickened scales.

The wood is hard, strong and quite tough, close-grained, light yellowish brown; its specific gravity is 0.74. It is the most valuable oak timber on the Pacific slope, where it is used like the White oak of the eastern States. The nuts were used as food by the Indians.

It is also called White oak, Oregon white oak, Oregon oak, Western white oak, Mountain white oak.

Sadler's oak, *Quercus Sadleriana* R. Brown, is an interesting shrub of the high mountains of northwestern California and adjacent Oregon, with sharply serrate leaves, unlike those of any other American species.

58. HAIRY-LEAVED OAK — *Quercus submollis* Rydberg

This is a shrub or small tree of the mountains of Arizona, Nevada and New Mexico.

The bark is light gray and quite smooth. The twigs are hairy at first, becoming much roughened by numerous lenticels, dark brown or gray and shining. The buds are covered by thin, light brown, hairy scales. The leaves are narrowly obovate to oblong in outline, about 1 dm. long; the 5 to 9 lobes are usually entire, with a rounded or pointed apex, the sinuses often extending nearly to the midrib, narrow and rounded at the bottom; the leaf base is broadly wedge-shaped or truncate; they are thick and firm, dark green, sparingly hairy or smooth, shining and with conspicuous yellowish venation above, yellowish green, downy, with prominent venation beneath; petiole 8 to 20 mm. long. The hairy catkins are 3 to 5 cm. long; the pistillate flowers solitary, sessile, the short styles spreading. The fruit ripens the first season; nut oblong, 12 to 15 mm. long; shell very thin, dark brown; cup depressed-hemispheric, about 15 mm. across, embracing about one half the nut, covered with loose lanceolate, blunt, hairy, rather thin, brown scales scarcely thickened on the back.

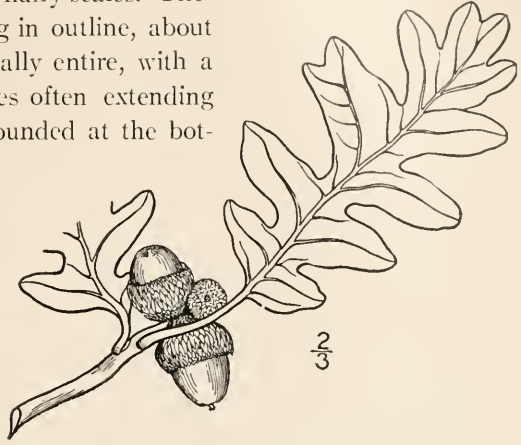


FIG. 296. — Hairy-leaved Oak.

This species, and the two following, have been confused with the shrubby *Quercus Gambelii* Nuttall, which is not known to us to form a tree. Several other related shrubs from the Rocky mountain region have been described as species.



FIG. 297. — Utah Oak.

59. UTAH OAK

Quercus utahensis (A. de Candolle)
Rydberg

Quercus stellata utahensis A. de Candolle

This small tree of the mountains of Utah, Colorado, Arizona, and New Mexico attains a maximum height of about 10 meters, although usually a shrub.

The bark is roughly furrowed. The twigs are hairy at first, sparingly roughened by lenticels, light brown becoming darker brown or dull gray. The

winter buds are brown, their scales thin and hairy. The leaves are broadly obovate in outline, 6 to 10 cm. long, the 7 to 9 lobes oblong to obovate, seldom lobed at the rounded apex, the sinuses deep and broad or narrow, slightly rounded at the bottom, the leaf base rather broad and rounded; they are thick and firm, dark green, shining and slightly hairy above, paler, brownish, softly downy, with prominent venation beneath; the petiole is about 1 cm. long and slightly hairy. The nearly sessile fruit ripens the first season; nut ovoid-oblong, 1.5 to 2 cm. long, blunt-pointed, light brown; cup hemispheric, 12 to 15 mm. across, embracing about one half the nut, covered with ovate, corky-thickened, hairy scales.

60. COLORADO WHITE OAK — *Quercus leptophylla* Rydberg

This tree, known only from Colorado, grows along stream banks, especially in cañons. It is the largest oak of the State, reaching a height of 15 meters, with a trunk diameter of about 7 dm.

The bark is furrowed, rough and gray. The twigs are slightly hairy, purplish



FIG. 298. — Colorado White Oak.

or brown, becoming smooth and gray. The leaves are broadly obovate in outline, 1 to 1.5 dm. long, the 5 to 9 lobes oblong to triangular, rounded or obliquely notched at the apex, the sinuses broad, sometimes reaching half-way to the midrib and rounded at the bottom, the base broad or cuneate-tapering; they are very thin and firm, light green, sparingly hairy at first, soon becoming smooth and slightly shining above, paler and smooth except on the prominent venation beneath;

the leaf-stalk is rather stout, about 1.5 cm. long. The fruit, ripening in the autumn of the first season, is nearly sessile; nut broadly oblong, 12 to 15 mm. long, blunt or depressed at the apex, embracing one half of the nut, covered by ovate-lanceolate, slightly thickened, blunt scales.

61. ASHE'S OAK — *Quercus Margaretta* Ashe

While usually a shrub, this sometimes becomes a tree 10 meters tall. It occurs in pinelands or open woods from Virginia to Florida and Alabama and is a near relative of the Post Oak.

The bark is very rough, the twigs rather stout, smooth, shining and reddish

brown. Its winter buds are very small, broadly ovoid and blunt. The leaves are numerous, oval or obovate in outline, 6 to 9 cm. long, 2-lobed to 5-lobed mostly above the middle, the sinuses rather shallow and rounded at the bottom, apex rounded or notched, the base roundish or tapering; they are light green, smooth and shining with yellowish impressed midrib above, pale or glaucous, more or less hairy on the prominent veins beneath, the petiole short and stout. The fruit ripens the first season, is sessile or nearly so; nut oblong to ovoid-oblong, from 12 to 14



FIG. 299. — Ashe's Oak.

mm. long, its apex tipped and hairy; cup top-shaped or hemispheric, 11 to 14 mm. across, embracing over half of the nut and covered with sharp-pointed scales which are much larger toward the base of the cup than at the rim.

62. POST OAK — *Quercus stellata* Wangenheim

Quercus minor Sargent. *Quercus alba minor* Marshall. *Quercus obtusiloba* Michaux

A tree of dry or rocky soils from Massachusetts to Pennsylvania, Ohio, Missouri, and Kansas, southward to Florida and Texas, attaining a maximum height of about 30 meters, with a trunk diameter of 1.5 m.

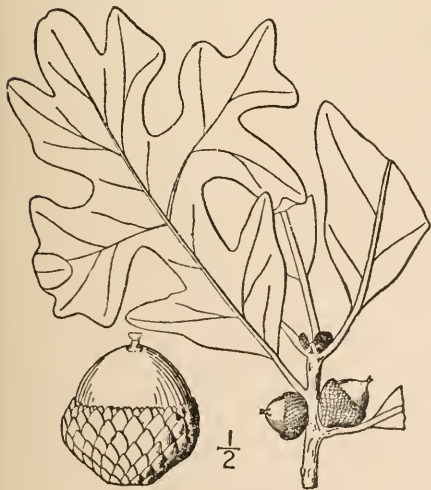


FIG. 300. — Post Oak.

The branches are stout and spreading, forming a close round-topped tree. The bark is up to 3 cm. thick, deeply furrowed, the flattish ridges covered with close gray or brownish gray scales. The twigs are stout, brownish-woolly, becoming smooth, gray, or dark brown to almost black. The winter buds are broadly ovoid. The leaves are obovate in outline, 1 to 2 dm. long, the usually 5 lobes broad and spreading, the middle pair of sinuses deep, wide and oblique, rounded at the bottom, the lobes

rounded or notched at the apex, the base narrowed, wedge-shaped or rounded; they are thick and firm, shining, with scattered hairs above, densely gray or yellowish hairy beneath, the midrib broad, prominent beneath; the leaf-stalk is slightly flattened, hairy, 12 to 20 mm. long. The flowers appear from March to May, according to latitude, when the leaves are about one half unfolded, the staminate catkins 7.5 to 10 cm. long and hairy; calyx usually 5-lobed, hairy and yellow; anthers broad, notched, hairy. The pistillate flowers are usually sessile, hairy; styles very short, broad, spreading and bright red. The fruit is usually sessile, sometimes short-stalked, often in pairs or clustered; nut ovoid, 1.5 to 2 cm. long, hairy at apex; cup hemispheric, narrowed at base, 1.5 to 2 cm. across, pale, hairy within, thin and embracing one third to one half the nut, its scales thin, rather flat, pale woolly.

The wood is hard, close-grained and brown, its specific gravity about 0.84. It is quite durable in contact with the soil and is much used for railroad ties and fencing, carriage work and cooperage.

This beautiful tree should be more often seen in our parks and public grounds, though it is of slow growth and demands a light soil.

It is also known as Box white oak, Iron oak, Overcup oak, White oak, Box oak, and Brash oak.

Boynton's oak, *Quercus Boyntoni* Beadle, a shrub forming large clumps, sometimes becomes tree-like, 5 meters tall, with a trunk diameter of 1 dm., and grows in rocky soil in Georgia and Alabama. It differs from the Post oak in its smaller stature, smaller, narrow, wedge-shaped leaves, the shallow lobes of which are confined to the upper half of the leaf; the smaller fruit has a more top-shaped cup.

63. WHITE OAK — *Quercus alba* Linnæus

This majestic tree of rich woods from southern Maine to Ontario and Minnesota, southward to Florida and Texas, attains a maximum height of about 45 meters, with a trunk diameter of 3 m. It is sometimes called Stave oak on account of the use of the wood in cooperage.

The branches are stout and spreading, the tree being broad, sometimes broader than high, if growing in the open; in the forest the trunk is usually free of branches for half of its height or more, the branches short, forming a narrow head. The bark is up to 5 cm. thick, shallowly fissured into flat ridges, or on younger stems broken into thin scales of a light gray or nearly white color. The twigs are slender, light reddish green, and woolly, soon becoming reddish brown, smooth and shining, and finally light gray. Winter buds blunt, about 2 mm. long, reddish brown. The leaves are mostly obovate in outline, 1 to 2 dm. long, the 3 to 9 lobes ascending, the lobes blunt at the apex, entire or with 1 or 2 secondary lobes; sinuses wide and rounded at the bottom, usually very deep; they are narrowly wedge-shaped at the base, light red and very woolly when unfolding, becoming thin and firm, bright green, shining or dull and smooth above, pale, glaucous

and smooth beneath, the midrib stout and bright yellow, the venation prominent; they turn deep red before falling in late autumn; the leaf-stalk is stout, flattened and grooved above, 1 to 2 cm. long. The flowers appear when the leaves are about one third unfolded, the staminate catkins 5 to 7 cm. long; calyx bright yellow and hairy; stamens slightly exserted; anthers broadly oblong and notched. The pistillate flowers are short- or long-stalked; involucreal scales broadly ovate; calyx-lobes ovate, sharp-pointed and hairy; styles very short, spreading and red. The fruit ripens in the early autumn of the first season, is sessile or sometimes stalked, light brown and shining; seed rather sweet; cup saucer-shaped or shallowly hemispheric, 1.5 to 2 cm. across, embracing one fourth to one third of the nut, covered by thickened or tuberculate woolly scales, those near the top of the cup thinner.



FIG. 301. — White Oak.

The wood is hard, strong and tough, close-grained and light brown; its specific gravity is about 0.75. It is one of the most important of American timbers, being largely used in general construction, interior finishing and for furniture, cooperage, carriages and agricultural implements, railroad ties, split baskets, and is preferred over many other woods for fuel.

Probable hybrids have been attributed to this species with the Rock chestnut oak, *Q. Prinus* Linnæus, from three or four widely separated stations; with the Bur oak, *Q. macrocarpa* Michaux, from Vermont and Illinois, with the Post oak, *Q. stellata* Wangenheim, from the District of Columbia, Illinois, and Missouri, with the Yellow chestnut oak, *Q. Muhlenbergii* Engelm, in Missouri; with the Cow oak, *Q. Michauxii* Nuttall, from North Carolina.

THE ELM FAMILY

ULMACEÆ Mirbel



LMS are closely related botanically to about fourteen other genera of trees and shrubs, including in all about 140 species, which are widely distributed in temperate and tropical regions. These agree in having alternate stalked simple pinnately veined leaves, usually toothed and sometimes 3-nerved at the base; the stipules are fugacious, that is, they fall away while the leaves are unfolding, and are hence liable to be overlooked. The flowers are small and incomplete, having no corolla, and they are either perfect or imperfect. The calyx is from 3-parted to 9-parted, the divisions or sepals often separate to the base. In the trees here described there are as many stamens as there are divisions of the calyx, and they are opposite them; the anthers split lengthwise to discharge the pollen. The ovary is 1-celled or very rarely 2-celled, superior; there is 1 pendulous ovule; there are 2 styles or 2 sessile stigmas. The fruit varies greatly in the several genera, being either a samara (*Ulmus*), a small nut (*Planera*), or a drupe (*Celtis* and *Trema*). The seed has little endosperm or none. They are of little value except for their timber and as shade trees.

Our genera may be distinguished by the following characters:

Fruit dry, a samara or small nut.

Fruit a samara, winged all around.

Fruit a small nut, bearing soft tubercles.

Fruit fleshy, juicy; a drupe.

Drupes stalked, solitary in the leaf-axils.

Drupes cymosely clustered in the axils.

1. *Ulmus*.

2. *Planera*.

3. *Celtis*.

4. *Trema*.

I. THE ELMS

GENUS **ULMUS** [TOURNEFORT] LINNÆUS



THE ancient Latin name of the elm was accepted by Linnæus as the botanical name of the genus. In America, besides the six species here described, one occurs in southern Mexico and Central America, and about ten others exist in Europe and Asia. *Ulmus parvifolia* Jacquin, of China and Japan, is a shrub, but the other species are all trees. The wood of the elms is hard and strong, and is of much importance commercially. The trees are much planted for shade and ornament.

The leaves are two-ranked, straight-veined, toothed, and usually very unequal-

sided. The flowers are small, variously clustered, and almost always perfect, though sometimes polygamous, vernal in most of the species and then appearing before the leaves, autumnal in a few species and then appearing in the axils of leaves of the season. The usually bell-shaped calyx is from 4-lobed to 9-lobed, the lobes sometimes extending nearly to its base; it remains permanently attached to the fruit; there is no corolla; the stamens are about as many as the calyx-lobes, with filaments mostly longer than the calyx and short oval or oblong anthers; the ovary is sessile or borne on a stipe, laterally flattened, and usually 1-celled (rarely 2-celled); there are 2 styles, stigmatic along the inner side; there is but 1 ovule. The fruit is a samara, usually winged all around the seed-bearing part, except at the apex, the wing flat and membranous.

The European species, *Ulmus campestris* Linnæus, is the type of the genus; it is much planted for ornament and shade.

Autumn-flowering; flowers in the axils of leaves of the season; southern trees, their branches sometimes corky-winged.

Leaves obtuse, very rough above; samara-wing short-ciliate.

1. *U. crassifolia*.

Leaves acute or acuminate, smooth or nearly so above; samara-wing long-ciliate.

2. *U. serotina*.

Spring-flowering; flowers appearing before the leaves.

At least some of the branches corky-winged; samara-faces pubescent.

3. *U. Thomasii*.

Leaves 5 to 13 cm. long; flowers racemose; northern tree.

4. *U. alata*.

Leaves 2 to 10 cm. long; flowers fascicled; southern tree.

None of the branches corky-winged.

Leaves smooth or somewhat roughened above; samara-faces glabrous; pedicel longer than the calyx.

5. *U. americana*.

Leaves very rough above; samara-faces pubescent over the seed, the margins not ciliate; pedicel shorter than the calyx.

6. *U. fulva*.

1. CEDAR ELM — *Ulmus crassifolia* Nuttall

Preferring moist soil, and most abundant in river valleys, the Cedar elm occurs from southern Arkansas to Mississippi, Texas, and northern Mexico. It attains a maximum height of about 30 meters and a trunk diameter of about 1 meter; the branches are usually drooping.

The thick brown bark is deeply fissured and the flattened ridges are scaly. The young twigs are reddish and finely velvety; they sometimes develop thin corky wings, occasionally 1 cm. wide. The leaves are firm in texture, oblong to ovate, blunt, finely



FIG. 302. — Cedar Elm.

and often doubly toothed, very rough and dark green on the upper surface, and hairy on the lower, small, 5 cm. long or less, with hairy stalks 2 to 4 mm. long; the stipules are prominent on the young leaves, sometimes 1 cm. long, but fall away early. The flowers appear in the autumn, in small short-stalked clusters in the leaf-axils; the calyx is deeply cleft into narrow lobes, about as long as the hairy ovary and somewhat shorter than the stamens. The samara is oval, 8 to 10 mm. long, whitish hairy all over, especially on the edges.

The tree has been planted for shade in towns and cities within its range; its wood is reddish brown, rather weak, with a specific gravity of about 0.70, and is locally used for furniture and hubs.

2. RED ELM — *Ulmus serotina* Sargent

This tree is known to inhabit banks and bluffs only in parts of Tennessee, Georgia, and Alabama, and is thus apparently one of the most restricted in geographic distribution, though its range is likely enough to be extended when it

becomes better known. It sometimes attains a height of 16 meters, with a trunk diameter of about 1 meter; it was long supposed, from the similarity of its leaves, to be identical with the more northern Cork elm *U. Thomasii* Sargent.

The bark is thin and not deeply fissured, light brown and scaly. The young twigs are smooth or nearly so, and reddish brown; they become grayish after the first year's growth and usually corky-winged. The leaves are oblong to ovate or somewhat obovate, pointed, often long-pointed, firm in texture but rather thin, smooth or very nearly so, shining and light green on the upper surface, hairy on the veins on the



FIG. 303. — Red Elm.

under side, coarsely toothed, 5 to 10 cm. long, with stalks 7 mm. long or less, the stipules about as long as the stalks and falling away when the blades are nearly fully grown. The flowers are in small racemes in the axils of leaves of the season, appearing in the autumn; the calyx is cleft nearly to the base into blunt spatulate lobes and is considerably shorter than the stamens. The samara is oblong to elliptic, 10 to 12 mm. long, stalked, and fringed with long white hairs.

The hard, heavy, strong wood is light reddish brown in color and is locally used for furniture. The tree has been planted for shade in some southern cities.

3. CORK ELM — *Ulmus Thomasi* Sargent

Ulmus racemosa Thomas, not Borckhausen

The Cork elm, often called Rock elm, and sometimes Hickory elm, inhabits hillsides and slopes, occurring from Quebec and Ontario to Michigan and Wisconsin, south to Connecticut, northern New Jersey, Ohio, Missouri, and eastern Nebraska. It attains a maximum height of about 35 meters, and the trunk is occasionally at least 1 meter in thickness.

The bark is thick and deeply fissured, gray or gray-brown and scaly. The young twigs are brownish and softly velvety, becoming smooth after the first or second season, and usually developing two, three, or four corky wings, which become about 1 cm. wide. The oval to obovate leaves are short-pointed, firm in texture, coarsely and usually doubly toothed, 5 to 12 cm. long, the upper surface smooth, shining and dark green at maturity, with the veins impressed, the lower surface finely hairy, pale green, with the nerves prominent; the large stipules fall away early; the leaf-stalks are 4 to 10 mm. long. The flowers appear before the leaves in early spring in small smooth clusters, each borne on a very slender, drooping stalk nearly 1 cm. long and much longer than the calyx; the bell-shaped calyx is lobed only to or above the middle, with blunt lobes; the stamens are a little longer than the calyx, and the ovary is hairy. The oval samaras are 12 to 20 mm. long, finely hairy all over, their short tips incurved.

The wood is used extensively for bridges, sills, agricultural implements, and railroad ties, being very strong and durable; it is light brown with a specific gravity of 0.73. The tree is occasionally planted for shade or ornament. Though long known as *Ulmus racemosa* Thomas, botanically, this name was earlier applied to a different species, and has to yield to the one here adopted.

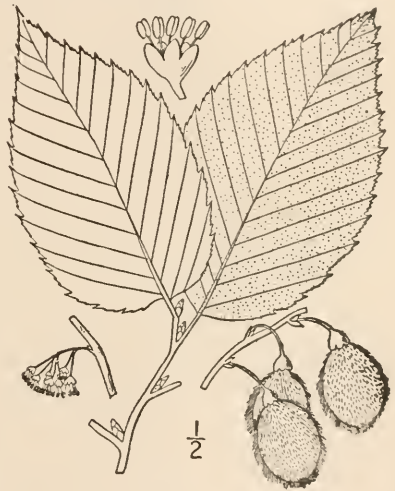


FIG. 304. — Cork Elm.

4. WINGED ELM — *Ulmus alata* Michaux

This southern tree attains a maximum height of about 20 meters, with a trunk sometimes 1 meter in diameter. It ranges from Virginia westward through southern Indiana and Illinois to Kansas, south to Florida and Texas, preferring dry soil.

The name "winged" elm is with reference to the plentiful development of corky wings on its branches; it is also commonly known as Wahoo.



FIG. 305. — Winged Elm.

The bark is thin, shallowly fissured, scaly and light reddish brown. The young twigs are very finely and sparingly hairy, or quite smooth, and usually develop corky wings which are long-persistent. The leaves are oblong to oblong-ovate or oblong-lanceolate, sharp-pointed, often curved, thick, rather coarsely doubly toothed, and 8 cm. long or less; the upper surface is dark green, dull and smooth at maturity, the lower surface lighter green and hairy, at least along the numerous prominent veins; the leaf-stalks are seldom more than 5 mm. long and the large thin stipules fall away early. The tree blooms in earliest spring before the leaves unfold; the drooping flowers are in small, smooth clusters, with a 5-lobed calyx about one half the length of the

stamens, and a short hairy ovary. The samaras are oblong or elliptic, hairy all over, long-fringed on the edges, 6 to 10 mm. long, the 2 long beaks slightly incurved.

The wood is hard, light brown, difficult to work, and not strong; it has a limited use for tool-handles; the specific gravity is about 0.75. The tree is much planted for shade and ornament in the southern States, but is not certainly hardy much to the north of New York City.

5. WHITE ELM — *Ulmus americana* Linnaeus

Ulmus floridana Chapman

This, the largest of our elms, ranges from Newfoundland to Florida, westward to Saskatchewan, South Dakota, western Kansas, and Texas. It reaches its greatest development in moist soil, but grows well on hillsides and uplands. In New England it sometimes attains a height of about 40 meters, with a buttressed trunk occasionally 3.5 meters in diameter, but in the southern parts of its area it is much smaller. The main branches are usually nearly upright. It is also called Swamp elm and American elm.

The thick bark is fissured into flat ridges, gray and scaly. The young green twigs are either smooth or quite hairy, soon become reddish brown, and do not develop corky ridges. The oval to obovate leaves are abruptly pointed, 5 to 15 cm. long, sharply and usually doubly toothed, dark green and either smooth or roughish on the upper surface, paler and hairy on the under side, at least along the veins; the stipules, which are sometimes 2 cm. long, fall away much before the



FIG. 306. — White Elm, New York Botanical Garden.

leaves are fully grown; the leaf-stalks are 3 to 10 mm. long. The clustered flowers unfold long before the leaves in earliest spring, or, in the southern States, in late winter; they are borne on slender stalks; the calyx is much shorter than the stamens, and its lobes are short and hairy-fringed. The samaras are oval to obovate, the two tips converging, overlapping, or erect, its reticulated faces smooth, its edges fringed with long hairs.



FIG. 307. — White Elm.

The White elm has been more extensively planted for shade and ornament than any other American species, but its use for these purposes has been discouraged in recent times by the ravages of the Elm Beetle, and it is no longer so highly esteemed. The wood is hard and strong, splits only with difficulty, is light brown, with a specific gravity of about 0.65; it is largely used in ship-building, for flooring, and for hubs and barrels.

Trees occur in northern New Jersey with very rough bark deeply furrowed and but little scaly.

6. SLIPPERY ELM — *Ulmus fulva* Michaux

The Slippery elm, so called from its mucilaginous inner bark, is also commonly known as the Red elm, and sometimes as Moose elm. It has also been termed *Ulmus pubescens* botanically, on account of a tree described by Thomas Walter under that name in 1788, fifteen years before the name *fulva* was published by Michaux; it is, however, uncertain just what species Walter had in mind, as his description is unsatisfactory. The tree inhabits hillsides and banks of streams, preferring rocky soil, and ranges from Quebec to Florida, westward to North Dakota, Nebraska, and Texas; it is uncommon near the coast south of New York. It attains a maximum height of about 25 meters and its trunk is occasionally 6 dm. in thickness.

The rough, thick fissured bark is dark reddish brown, its inner layers fragrant and highly mucilaginous. The young twigs

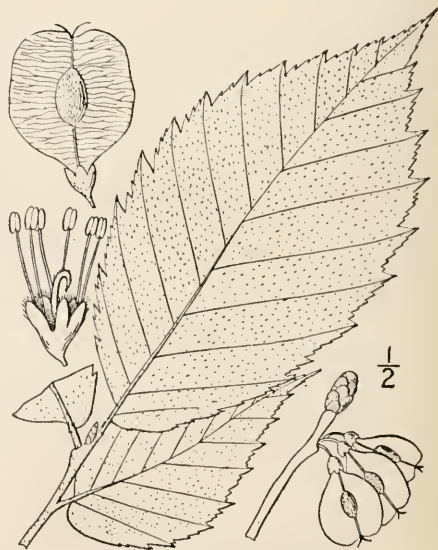


FIG. 308. — Slippery Elm.

are rough-hairy and green, but soon become gray, or brown and are smooth or nearly so after their first season. The leaves are ovate, oval, or sometimes obovate, usually long-pointed, firm in texture, 7 to 18 cm. long, the upper surface exceedingly rough-papillose and dark green, with the veins impressed, the under side usually densely covered with whitish hairs; their edges are sharply and usually coarsely doubly toothed; the stipules fall away soon after the leaves unfold; the leaf-stalks vary from 3 to 10 mm. in length. The flowers appear in early spring before the leaves, in small, dense clusters; the hairy calyx is lobed to the middle or above, and is about two thirds as long as the stamens; its lobes are blunt. The samaras are short-stalked, oval-orbicular, 12 to 18 mm. long, hairy over the seed but otherwise smooth, sometimes slightly notched, but not 2-beaked as in our other Elms, bearing the 2 very small stigmas.

The wood is durable in the soil, and is used for sills, posts, and railway-ties; also for implements, tools, and hubs; its specific gravity is about 0.70 and its color is brown or reddish brown. The powdered inner bark is used for poultices.

II. PLANER TREE

GENUS **PLANERA** GMELIN

Species **Planera aquatica** (Walter) Gmelin

Anonymos aquatica Walter



THE Planer-tree, also called Water-elm, is the only representative of its genus, and thus known scientifically as a monotype. It grows in swamps, ranging from North Carolina to Florida, westward to Kentucky, southern Illinois and Missouri to Texas, and much resembles a small-leaved Elm, but may be distinguished from *Ulmus* by its fruit, which is a small nut covered with short soft projections, and by its monœcious or sometimes polygamous flowers, which appear with the leaves in early spring. It is a small tree, rarely becoming more than 12 meters high, and then having a trunk 5 or 6 dm. thick. The name Planera is in honor of Johann Jacob Planer, 1743 to 1789, who was Professor of Botany in Erfurt.



FIG. 309. — Planer Tree.

The thin brown bark falls away in large scales. The buds are very small, roundish, composed of many brown scales. The young slender twigs are reddish

brown, later becoming gray. The leaves vary from ovate to oblong-lanceolate and from 2 to 6 cm. long; they are either blunt or pointed, toothed, except at the rounded or somewhat heart-shaped base, thick, slightly hairy when young, glabrous, and a little rough on both sides when mature, dark green above, paler beneath; the leaf-stalks are 7 mm. long or less, and the red stipules fall while the leaves are unfolding. The staminate flowers are nearly stalkless in clusters on twigs of the preceding year, the pistillate and perfect ones borne 2 or 3 together in the axils of young leaves of the season, and stalked; both kinds are very small. The bell-shaped calyx is rather deeply 4-lobed or 5-lobed, the lobes blunt; there is no corolla; in the staminate and perfect flowers there are as many stamens as there are calyx-lobes, with long filaments and short ovate anthers; the ovary has a short stipe, is 1-celled, tubercled, and bears 2 styles, which are stigmatic on the upper side. The fruit is a curious structure, oblong-ovoid, nut-like, covered with soft processes, which grow out from the tubercles on the ovary; it is about 6 mm. long, and about as long as its stalk, the calyx persistent at the base.

The wood is soft and light brown with a specific gravity of only 0.53. It is of no economic value.

III. THE HACKBERRIES

GENUS **CELTIS** [TOURNEFORT] LINNÆUS



CELTIS is composed of about 60 species of trees and shrubs, widely distributed in temperate and tropical regions of both the Old World and the New. Besides the kinds here described, which are closely interrelated, several occur in the West Indies and Central America; *Celtis jamaicensis* Planchon is endemic in Jamaica; *Celtis caudata* Planchon and others in Mexico, and *C. trinervia* Lamarck in Cuba, Jamaica, and Santo Domingo; the European and Asiatic *Celtis australis* Linnæus is the type of the genus. The genus *Momisia*, which includes several American species, two of which occur as shrubs in the southern States, is here regarded as distinct from *Celtis*, and *C. monoica* Hemsley, from Huasteca, Mexico, which has equilateral, regularly pinnately veined leaves, must also be excluded from *Celtis* when its fruit becomes known.

The name *Celtis* was used by Pliny for an African lotus-tree, but was taken up by Linnæus, following Tournefort, for the trees with which it is associated in modern times.

The bark of the Hackberries often develops numerous corky warts or ridges, which are sometimes very conspicuous on old trees. The branching is irregularly pinnate, at least in all the North American species, and the twigs are not armed with thorns as they are in *Momisia*. The wood is tough and the sap watery. The leaves are unequal-sided, often prominently so, and mostly unfold with the flowers or a little before them in the spring; they are stalked, and provided with

very thin stipules, which fall away early. The small greenish flowers are polygamous or monœcious, borne in the axils of the leaves of the season, the staminate ones clustered, the pistillate either solitary or several together; there is a 4-lobed or sometimes 5-lobed calyx, but no corolla; as many stamens as there are calyx-lobes, their filaments at first curved inward but spreading when the flower expands, those of the pistillate flowers much shorter than those of the staminate. The sessile ovary is 1-celled; the style is very short or altogether wanting, and there are 2 recurved narrow stigmas. The fruit is a small smooth globular to oblong drupe, its exocarp pulpy, the endocarp bony.

Trees of eastern, southern, and middle North America.

Leaves not gray-tomentulose beneath, glabrous, or more or less hairy.

Leaves thin, not strongly reticulate-veined beneath; eastern trees.

Pedicels long, mostly twice as long as the drupe or longer.

Leaves ovate to ovate-lanceolate; drupe 8 to 10 mm. in diameter.

Leaves smooth or nearly so above.

Leaves acute or short-acuminate; drupe subglobose.

1. *C. occidentalis*.

Leaves attenuate-acuminate; drupe oblong.

2. *C. canina*.

Leaves very rough above; drupe subglobose.

3. *C. crassifolia*.

Leaves lanceolate to ovate-lanceolate; drupe 6 to 8 mm. in diameter.

Leaves entire, or few-toothed near apex.

4. *C. mississippiensis*.

Leaves sharply serrate.

5. *C. Smallii*.

Pedicels short, less than twice as long as the drupe.

6. *C. georgiana*.

Leaves thick, coriaceous, strongly reticulate-veined beneath; western tree.

7. *C. reticulata*.

Leaves densely gray-tomentulose beneath, cordate; Texan tree.

8. *C. Helleri*.

Northwestern tree; leaves ovate.

9. *C. Douglasii*.

1. HACKBERRY — *Celtis occidentalis* Linnaeus

The Hackberry tree, also known as Sugarberry, inhabits dry hillsides and ledges, ranging from Quebec to North Carolina, westward to Manitoba, Nebraska, and Oklahoma. It is usually a small tree, and in rocky places sometimes only a shrub, but occasionally becomes 20 meters high, with a trunk diameter of 4 to 8 dm.

The bark is rough, often corky-ridged or warty, thick, gray-brown, and at length scaly. The young branches are slender and vary from smooth to quite hairy; they are light green at first but become red-brown. As with the elms the buds are all axillary; they are finely hairy and about 6 mm. long. The leaves are thin, ovate to ovate-lanceolate, coarsely toothed to quite entire-margined, 5 to 10 cm. long, sharply pointed and on young shoots sometimes long-pointed and much larger; the upper surface is smooth or but little roughened, rather light green and dull, the under side slightly paler and hairy; the leaf-stalks vary from 6 to 16 mm. long, and the linear stipules fall soon after the leaves begin to unfold in the spring. The small green flowers appear with the leaves on shoots of the



FIG. 310. — Hackberry, Tottenville, Staten Island.

season; they are stalked and axillary, either solitary or several together; the stami-

nate ones usually have 5 stamens a little longer than the calyx, borne on the white-woolly receptacle; the perfect flowers have a white-woolly ovary and as many stamens as there are sepals. The fruit is globular or nearly so, red, orange purple or nearly black, smooth, 7 to 10 mm. in diameter, borne on stalks usually longer than those of the leaves; its stone is pointed and oblong.

The wood is heavy, having a specific gravity of over 0.70, and has a limited use for furniture and fencing. The tree is of very slow growth but is of great interest. It is also known as False or Bastard elm, Nettle-tree, Hogberry, and Dog-cherry.



FIG. 311. — Hackberry.

2. DOG HACKBERRY — *Celtis canina* Rafinesque

This tree has a range similar to that of the preceding species, but, as it has not been closely studied, the limits of its geographic distribution are as yet undetermined. It is known to occur from New York to Illinois and South Dakota, southward to Pennsylvania and Missouri, preferring rich soil, growing in fields and meadows, and attains much greater dimensions than the rock-loving species, being sometimes at least 30 meters in height.

The young twigs are green and either smooth or hairy. The leaves are ovate-lanceolate or broadly lanceolate, light green, often 12 cm. long (8 to 16 cm.), coarsely toothed, thin and drawn out into long slender tips; the upper surface is smooth, except when young, and the rather pale under side is hairy, at least along the veins; the slender leaf-stalks are 2 cm. long



FIG. 312. — Dog Hackberry.

or less, and about one half as long as the stalk of the fruit. The fruit is oblong, about one half longer than thick, purple, about 1 cm. long.

3. ROUGH-LEAVED HACKBERRY — *Celtis crassifolia* Lamareck

This is the largest and most elegant species of the genus, sometimes attaining a height of 40 meters and a trunk diameter of nearly 1 meter. It prefers rich soil and reaches its greatest development in river valleys, though it sometimes grows in dry or even rocky situations, when it is small, or even shrub-like. It ranges from Massachusetts (according to Emerson), New Jersey, Pennsylvania to South Caro-



FIG. 313. — Rough-leaved Hackberry.

lina, westward to Indiana, South Dakota, Tennessee, Kansas, and Colorado.

When well developed the trunk is tall and straight, often without branches for

15 meters or more; its bark is thick and usually corky-roughened or warty, though sometimes smooth. The young twigs are hairy and green, but become smooth and reddish brown. The leaves are ovate to ovate-lanceolate, pointed, coarsely toothed, though sometimes with few teeth, often 15 cm. long, and rather thin; they are dark green and rough, with papillæ on the upper surface, which is covered with short stiff hairs until the leaf is nearly or quite mature; the lower surface is rough-hairy, especially along the veins. The nearly black short-oblong or nearly round fruit is about 1 cm. in diameter, its stalk longer than the leaf-stalk.

The wood is heavy, not very strong, light yellow; it has a limited use for furniture, flooring, and fencing.

4. MISSISSIPPI HACKBERRY — *Celtis mississippiensis* Bosc

A tree which under favorable conditions attains a height of 30 meters, with a trunk about 1 meter in thickness. It prefers the moist soil of river valleys and banks, and ranges from Georgia and Florida westward to Tennessee, southern Illinois, Missouri, Texas, and northeastern Mexico, and also occurs in Bermuda.



FIG. 314. — Mississippi Hackberry.

The fruit is ovoid-globose, orange or red, 4 to 7 mm. in diameter, its stalk longer than the subtending leaf-stalk.

The wood is yellow and soft, has a specific gravity of about 0.50, and is largely used for fencing and to some extent for furniture and flooring.

Berlandier's hackberry, *Celtis Berlandieri* Bosc, which occurs in the valley of the Rio Grande in Texas and Mexico, has relatively shorter ovate leaves and slightly larger fruit; it is not certainly distinct, however, from *C. mississippiensis*.

5. SMALL'S HACKBERRY — *Celtis Smallii* Beadle

The known range of this recently described tree is from North Carolina and Tennessee to Georgia, Florida, Alabama, and Texas. It has been confused with the Mississippi hackberry, but appears to differ from that species by its sharply toothed leaves; the two are, however, closely related. It prefers wet soil and inhabits river shores and swamps in Georgia, attaining a height of 25 meters, with a trunk diameter of about 6 dm.

The young twigs are very slender, smooth, green, becoming purplish brown. The leaves vary from lanceolate to ovate-lanceolate; they are thin, delicately but rather conspicuously veined, long-pointed, slender-stalked, somewhat hairy when young but nearly or quite smooth when fully grown, 5 to 10 cm. long, their edges sharply toothed; the upper surface is somewhat darker green than the lower; the leaf-stalks are 8 to 18 mm. long; the stipules fall away after the leaves begin to unfold. The sepals of the staminate flowers are narrowly oblong and blunt. The nearly globular fruit is 5 to 7 mm. in diameter, its slender stalk equalling or longer than the subtending petiole.



FIG. 315. — Small's Hackberry.

6. GEORGIA HACKBERRY — *Celtis georgiana* Small

FIG. 316. — Georgia Hackberry.

The Georgia hackberry inhabits rocky or gravelly soil and ranges from New Jersey to Florida, Kentucky, Missouri, and Alabama. It is usually a mere shrub, sometimes flowering when 2 meters high or less, but sometimes becomes a tree 6 to 10 meters high.

The young twigs are hairy, greenish, slender, becoming smooth and purple-brown. The leaves are smaller than those of the other species, not 5 or 6 cm. in length, rather thick when young.

short-pointed or bluntish, toothed, or sometimes nearly or quite entire-margined, the base usually more or less cordate; they are bright green and roughish on the upper surface, lighter green and somewhat hairy beneath, at least on the veins; the leaf-stalks are short, stout, hairy. The fruit varies in color from red-purple to yellowish, is globular, 6 to 8 mm. in diameter and usually more than one half as long as its usually short stalk, which equals or exceeds the subtending leaf-stalk in length.

7. THICK-LEAVED HACKBERRY — *Celtis reticulata* Torrey

This is a small tree, perhaps never over 15 meters high, and grows in rocky or gravelly soil, especially along rivers, from Kansas to Texas, Colorado, Nevada, Arizona, and southern California, and is reported as extending into Lower California.

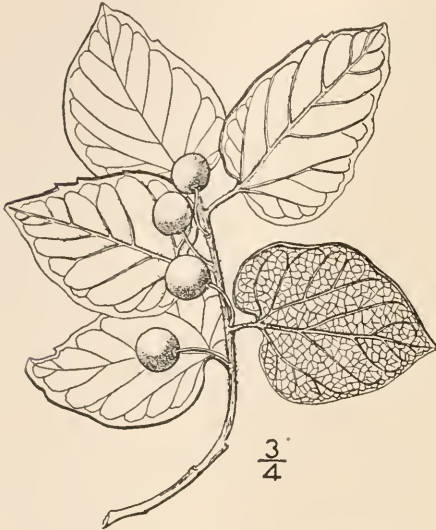


FIG. 317. — Thick-leaved Hackberry.

The bluish-gray bark has many corky warts or ridges, which are sometimes 3 cm. high. The young twigs vary from quite hairy to nearly or quite smooth; they are green at first, but early become brown. The leaves are thick, strongly netted-veined, with the veins impressed on the upper surface and prominent on the lower; they are 7 cm. long or less, ovate, pointed, bright green, and either very rough or nearly smooth above, pale green and hairy on the underside; their margins vary from nearly or quite entire to strongly toothed; the rather stout leaf-stalks are from 4 to 10 mm. in length.

The fruit is red, globular, 8 to 12 mm. in diameter, its stalk usually much longer than the subtending petiole of the leaf. It is also called Palo Blanco and simply Hackberry, in Texas. The wood is very similar to that of the eastern Hackberry, but heavier; its specific gravity being about 0.72.

8. HELLER'S HACKBERRY — *Celtis Helleri* Small

This hackberry grows in dry soil in southern Texas, sometimes occurring as a tree with a maximum observed height of about 10 meters and a trunk diameter of 1.5 meters and has widely spreading branches.

The bark is covered with numerous corky warts. The young twigs are slender and hairy, becoming brown. The leaves are rather firm in texture, ovate to lanceolate, 4 to 9 cm. long, pointed or blunt, toothed, at

least above the middle, mostly heart-shaped at the base, dark green and very rough on the upper surface, finely gray-hairy on the lower and rather strongly netted-veined; their stout stalks vary from 3 to 10 mm. in length. The fruit is nearly globular, 7 to 10 mm. in diameter, light brown and shining, its curved stalk 1 to 1.5 cm. long.

9. DOUGLAS' HACKBERRY

Celtis Douglasii Planchon

This tree inhabits river valleys in Idaho, Oregon, Washington, and British Columbia,



FIG. 319. — Douglas' Hackberry.

fruit is about 8 mm. in diameter and black when ripe.



FIG. 318. — Heller's Hackberry.

south to Utah and Colorado, and much resembles the Thick-leaved hackberry of the southwest, with which it has been confused, and it is also closely related to the eastern *Celtis occidentalis*. It attains a height of about 7 meters, but is usually lower, and commonly a mere shrub.

The bark is bright brown and rough, the young twigs hairy. The leaves are ovate to ovate-lanceolate, 10 cm. long or less, pointed, often long-pointed, rough above, rather strongly netted-veined beneath; their stalks are hairy and short, usually not more than 6 mm. long. The flower-stalks are slender, equalling or 3 or 4 times as long as the leaf-stalks, and loosely hairy. The globular

IV. THE TREMAS

GENUS TREMA LOUREIRO



HIS genus contains about 30 species of unarmed trees and shrubs, natives of tropical regions. The one here described occurs only in southern Florida, so far as is known. *T. micrantha* (Swartz) Blume, is abundant on Porto Rico and other West Indian islands, and in Central America; *T. Lamarckiana* (Roemer and Schultes) Blume, occurs on the Bahamas, Cuba, and Santo Domingo to Montserrat and Guadeloupe; *T. mollis*

(Wallich) Blume, on Cuba, and there are several other tropical American species. The type is *Trema cannabina* Loureiro, of Cochin-China.

The leaves are 3-nerved, short-stalked, equal-sided, or nearly so; their stipules fall away early. The very small green monœcious or polygamous flowers are borne in dense axillary cymes; the calyx is 4-parted or 5-parted, the divisions of the staminate calyx being valvate in the bud, those of the perfect flower somewhat imbricated; there are 4 or 5 stamens; the ovary is sessile and surmounted by 2 stigmas. The fruit is a very small globular drupe.

1. FLORIDA TREMA — *Trema floridana* Britton

While usually a shrub, this plant sometimes forms a single trunk 10 meters high and 10 to 15 cm. in diameter. It occurs along borders of woods and in thickets in southern Florida. The bark is about 4 mm. thick, the surface broken by shallow fissures into small oblong light brown plates. The twigs are round



FIG. 320. — Florida Trema.

and velvety. The leaves are ovate, very finely toothed all around, 5 to 12 cm. long, pointed, somewhat obliquely heart-shaped at the base, the upper surface very rough and dark green, the under side densely and finely gray-velvety; the leaf-stalks are stout and 8 to 15 cm. long. The reddish fruit is about 1.5 mm. long.

The wood is light, soft, close-grained and light brown, the split surfaces satiny.

THE MULBERRY FAMILY

MORACEÆ Lindley



HIS family contains about 55 genera, comprising some 925 species of trees or shrubs, many with milky sap, occurring in temperate and tropical regions of both hemispheres; some of them are of considerable economic importance, the Mulberries for their foliage as the food of the silkworm, and on account of their edible fruit, the Fig for its valuable fruit. The Bread-fruit, *Artocarpus communis* Forster, and other closely related species, is of very great value in tropical countries, and of increasing importance is the rubber obtained from several Asiatic species of *Ficus*, but more especially from *Castilla elastica* Cervantes, and perhaps other species from Central America, now being scientifically cultivated there, and in the West Indies.

The Moraceæ have mostly alternate persistent or deciduous leaves with deciduous stipules. The flowers are monœcious or diœcious, in usually axillary elongated catkins, heads, or on the inside of a hollow receptacle, and with but one series to the perianth, which is 3- to 5-lobed; the stamens equal in number the perianth divisions and are inserted at their base, the filaments thread-like, inflexed in the bud; ovary 1-or 2-celled, united with the 3 to 5 lobes of the accrescent perianth, which become fleshy, enclose the nutlets, and at maturity form an aggregate fleshy fruit; styles 1 or 2; ovules solitary, pendulous; endosperm fleshy or none.

Our arborescent species belong to the following genera:

Flowers not in a receptacle; fruit a syncarp.

Flowers all in spike-like catkins; fruit elongated, edible.

Pistillate flowers in heads; fruit globose, not edible.

Branches armed; fruit 5 to 15 cm. in diameter; leaves entire.

Branches unarmed; fruit 2 to 3 cm. in diameter; leaves various.

Flowers inside of a hollow receptacle; fruit a syconium.

1. *Morus*.

2. *Toxylon*.

3. *Papyrius*.

4. *Ficus*.

I. THE MULBERRIES

GENUS **MORUS** [TOURNEFORT] LINNÆUS



ABOUT 10 species of Mulberries are known, all trees or shrubs, natives of eastern North America, Central America, South America, Europe, but most abundant in Asia. They are well known for their edible fleshy fruits and as the favorite trees upon which the silkworm feeds. The tough bast of their bark is sometimes used for its strong coarse fiber. The

bark and roots of some are very yellow and are used as dyestuff, and the wood is valuable as lumber.

They have a milky sap. The leaves are alternate, membranous, 3-nerved, often deeply lobed, and deciduous. The flowers appear in early spring in the axils of the lower leaves, on different branches (monœcious), or rarely on different trees (diœcious). The staminate flowers are in elongated cylindric catkins, consisting of numerous short-stalked flowers; the perianth is deeply parted into 4 ovate blunt lobes; the stamens, 3 or 4, inserted at the base of the perianth under the rudimentary ovary; filaments thread-like, incurved in the bud, straight and exserted where the flower opens; anthers 2-celled, borne on a very broad connective, and opening lengthwise. The pistillate flowers are in shorter, stouter, dense catkins; the perianth is sessile, irregularly deeply 4-lobed, the lobes ovate or obovate, the two outer much the largest, accrescent, and enclosing the ovary; the ovary is sessile, 1-celled, terminated by a very short style divided into 2 thread-like hairy stigmas; ovule solitary, suspended from the top of the cell. The fruit is a juicy syncarp, an aggregation of crowded more or less united and compressed drupelets, consisting of the thickened juicy perianth enclosing the nutlets, which are tipped with the remnants of the stigmas.

Morus is the old classic name of the Mulberry tree, the type species being *Morus nigra* Linnæus.

Our species are:

Leaves glabrous beneath, or sparingly pubescent on the veins.

Leaves 6 to 20 cm. long, smoothish above; introduced Old World trees.

Fruit white or pinkish.

1. *M. alba*.

Fruit black.

2. *M. nigra*.

Leaves 2 to 6 cm. long, scabrous above; southwestern tree.

3. *M. microphylla*.

Leaves softly pubescent beneath; fruit red or purplish; eastern tree.

4. *M. rubra*.

1. WHITE MULBERRY — *Morus alba* Linnæus

This rapidly growing tree is of Asiatic origin and has come to us from Europe, where it is very generally naturalized. With us it is frequently naturalized from New England southward, and attains a maximum height of 12 meters, with a trunk diameter of 1 m. It was originally introduced as food for silkworms in an early attempt to establish silk-culture in this country.

The trunk is usually very short and low-branched; the bark is about 8 mm. thick, broadly furrowed into light brown ridges. The twigs are round, slender, hairy at first, becoming smooth, light grayish brown. The leaves are thin and firm, ovate or ovate-oval, 6 to 15 cm. long, sharp or taper-pointed, rounded or somewhat heart-shaped at the base, doubly toothed, sometimes lobed, slightly hairy when unfolding, becoming smooth and light green above, paler and hairy along the prominent venation beneath; the leaf-stalk is slender, somewhat hairy, 2 to 3 cm. long. The staminate catkins are slender, drooping, 1 to 2 cm. long, on

peduncles a little shorter; the pistillate catkins somewhat oblong, 0.5 to 10 mm. long. The fruit is subglobose to oval-oblong, 1 to 2 cm. long, varying greatly in size and quality, usually longer than its stalk, white or pinkish, sometimes nearly dry, and never as juicy as that of the Black mulberry.

The wood is moderately hard, close-grained, light yellowish brown; its specific gravity is about 0.71. It is used for various purposes in the Old World; said to be a favorite for wine casks in France. The leaves are the chief food of the silkworm and also used as fodder for goats and sheep. The bast is used as a coarse fiber; the root-bark as a vermifuge and as a dye. In Turkestan the dried fruit of this species or a related one is ground into meal for food.



FIG. 321. — White Mulberry.

2. BLACK MULBERRY — *Morus nigra* Linnæus

This tree is supposed to have come originally from Persia, but has been known in Europe for ages and is now widely naturalized there. In our area it has been introduced on account of its pleasant black fruit, and has become naturalized along roadsides and waste places in the southern States and also on the Pacific coast, attaining a maximum height of 20 meters, with a trunk diameter of 6 dm.



FIG. 322. — Black Mulberry.

The branches are numerous, slender and spreading, forming a large round head; the bark is slightly fissured, with many irregular dark gray scales; the twigs are round and slender, slightly hairy, becoming smooth and brownish gray. The leaves are thin and firm, ovate, 4 to 15 cm. long, short taper-pointed, rounded or heart-shaped at the base, sharply toothed on the margin, sometimes 2- or 3-lobed, hairy at first, becoming dark green and shining above, paler, with prominent venation be-

neath; leaf-stalk somewhat hairy, slender, about one third the length of the blade.

The staminate catkins are cylindric, 1 to 2 cm. long, on stalks 0.75 to 1.5 cm. long, somewhat crowded. The pistillate catkins are oval, 5 to 8 mm. long, on short thin hairy stalks. The fruit ripens in June or July, is oblong, 1 to 2 cm. long, black when fully ripe, with a deep red juice.

The wood is moderately hard, rather close-grained, yellowish brown. Its specific gravity is about 0.65. It is used like the wood of the White mulberry.

The juice of the ripe fruit is official in several European pharmacopœias, and in the form of a syrup is popular as a mild laxative and as an adjuvant to nauseous medicines.

The tree is very similar to the White mulberry in many respects, and hard to distinguish from it except by the black fruit.

3. TEXAN MULBERRY — *Morus microphylla* Buckley

Morus celtidifolia Sargent, not Humboldt, Bonpland and Kunth

This small tree, or shrub, occurs in various situations near our Mexican boundary, from western Texas to eastern Arizona and in northern Mexico. Its maximum height is 10 meters, with a trunk diameter of 4 dm.

The bark is about 10 mm. thick, furrowed and covered with small close red-



FIG. 323. — Texan Mulberry.

dish gray scales, on young stems, thinner and smooth. The twigs are green and whitish hairy, soon becoming nearly smooth, yellowish brown, bearing large leaf scars. The buds are ovoid, about 3 mm. long, sharp-pointed and covered by bright brown shining scales. The leaves are thin and firm, ovate, oval or suborbicular, 2 to 6 cm. long, taper-pointed, rounded and slightly heart-shaped at the base, margined by stout teeth, sometimes 3-lobed, hairy when unfolding, becoming less so, deep green and roughened above, pale, rough and often hairy, especially along the strong yellow midrib, beneath; leaf-stalk slender, hairy,

from 0.5 to 1 cm. long. The flowers open from March to May, according to altitude, and are usually diœcious. The staminate catkins are oblong, 1.8 to 2.5 cm. long, one third of which is stalk. The flowers are very numerous, short pedicelled; the perianth is dark green, hairy without, deeply 4-lobed, the lobes rounded and often red at the apex; the stamens have filiform filaments and yellow anthers;

there is a rudimentary ovary. The pistillate catkins are shorter, their flowers sessile, dark green, deeply and unequally 4-parted; the lobes rounded and somewhat hairy; ovary flattish, green and smooth; the short style is branched into 2 white stigmas. The fruit ripens in May and June, is oval-oblong, 1 to 1.5 cm. long, deep purple or black, rather acid and not very palatable; the nutlets are light brown.

The wood is hard, close-grained, elastic and light brown; its specific gravity is about 0.77. The Indians of Texas are said to have made their bows of this wood. This tree has been confused with the Mexican mulberry, *Morus cellidifolia* H. B. K., which has larger, more elongated, taper-pointed and finely toothed leaves, and from which it also differs by its small useless fruit.

4. RED MULBERRY — *Morus rubra* Linnaeus

This, the largest of our Mulberry trees, occurs mostly in woods of river valleys or on moist hillsides, from Massachusetts to Ontario, Michigan, and Nebraska, southward to Florida and Texas, attaining its greatest height of about 20 meters, and 2.5 meters in trunk diameter, in the central States; it grows also in Bermuda. It is also called Black mulberry, and Virginia mulberry.

The trunk is stout and rather short, the lower branches are stout and spreading, uncrowded trees becoming round-topped; the bark is about 18 mm. thick, fissured into long plates, the surface broken into long close scales of a dark reddish brown color; the twigs are slender, dark green, with a reddish tinge, with large raised leaf scars, eventually becoming dark brown. The winter buds are ovoid, 6 mm. long, blunt, covered by shining scales. The leaves are thin, or membranous, ovate, or ovate-orbicular, 10 to 20 cm. long, abruptly taper-pointed, rounded or heart-shaped at the base, singly or doubly toothed on the margin, or 3-lobed, yellowish green, slightly hairy above, white-woolly beneath when unfolding, becoming dark green, smooth or nearly so above, pale, more or less white-hairy, especially about the yellowish venation, or sometimes soft-hairy all over, beneath. The leaves turn bright yellow before falling in the early autumn; leaf-stalk stout, round, 1.5 to 3 cm. long; stipules large, conspicuous, yellowish, falling away early. The flowers appear with the leaves. The staminate catkins are slender, cylindric, 2.5 to 5



FIG. 324. — Red Mulberry.

cm. long, about one third longer than the slightly hairy peduncle; the deeply 4-parted perianth is hairy on the outer surface; the anthers are light green. The pistillate catkins are shorter stalked, spreading or pendulous, about half the length of the staminate ones; the perianth is deeply divided into 4 lobes, the two outer much larger than the inner, concave, rounded, and as long as the smooth, ovoid, ovary, which they entirely enclose; the 2 long stigmas are white. The fruit ripens in June and July, is cylindric, 3 to 6 cm. long, about 1 cm. thick, bright red, becoming nearly black, sweet and juicy; the nutlets are ovoid, sharp-pointed, light brown and very small.

The wood is soft, weak but tough, coarse-grained and dark yellow; its specific gravity is about 0.59. It is very durable and valued for posts and fencing and used in cooperage, especially for churns and for shoe lasts.

A handsome, rapid-growing tree, deserving wide cultivation as a shade-tree, sometimes planted for its fruit, which is valuable as food for poultry and swine.

II. OSAGE ORANGE

GENUS **TOXYLON** RAFINESQUE

Species ***Toxylon pomiferum*** Rafinesque

Maclura aurantiaca Nuttall. *M. pomifera* Robinson



TREE with milky sap and ridged brown astringent bark, occurring in the wild state only from Missouri to Kansas and Texas, but much planted elsewhere for hedges and for ornament; it has become practically naturalized at many places in the eastern and middle States. It attains a maximum height of about 20 meters, with a trunk 6 dm. in diameter or more, and is the only species of its genus. The name *Toxylon* signifies bow-wood, the wood having formerly been used by Indians for bows and other weapons, the bois d'arc.

The young twigs are green and softly hairy, soon becoming smooth and brownish. The buds are small and blunt, partly sunken in the twigs. The leaves are finely hairy when young, but smooth, dark green and shining when old; they bear stout spines in the axils, sometimes 5 cm. long; the leaves are alternate, stalked, pinnately veined, ovate-lanceolate to ovate-oblong, not toothed, 6 to 15 cm. long, pointed, the base rounded or somewhat cordate; they turn bright yellow in autumn; the stipules fall away soon after the leaves begin to unfold.



FIG. 325. — Osage Orange.

The flowers, which appear in May or June, after the leaves, are diœcious, the staminate ones on one tree, the pistillate on another. The staminate ones are in catkins 1 to 2.5 cm. long, and have a 4-parted calyx and 4 stamens. The pistillate flowers are in round, dense heads about 2.5 cm. in diameter, and have a 4-cleft calyx enclosing the 1-celled ovary, which is surmounted by a very long filiform style. In ripening the heads of pistillate flowers become very fleshy, much enlarged, forming an aggregate fruit (syncarp), which is yellowish green, 15 cm. in diameter or less, its surface roughened.

The tree suckers freely from cut stumps and from its roots. Its wood is very strong, hard, durable, orange-yellow, with a specific gravity of about 0.77. It is valuable for posts, sills, paving, wheels, and for small articles of woodenware. The bright yellow-barked root is said to furnish a yellow dye.

III. PAPER MULBERRY

GENUS **PAPYRIUS** LAMARCK

Species **Papyrius papyrifera** (Linnæus) Kuntze

Morus papyrifera Linnæus. *Broussonetia papyrifera* Ventenat



OUR species of *Papyrius* are known, all natives of eastern Asia; one of them, the Paper mulberry, the type of the genus, has been much planted for ornament, and has spread from cultivation to roadsides and waste places, suckering freely from its roots, occurring thus in the United States from New York to Florida and Missouri.

It is a small tree, with milky sap, greenish gray bark, and stout and densely hairy young twigs. The leaves are alternate, long-stalked, and vary much in outline from entire-margined to 3-lobed or 5-lobed, sometimes with a lobe on one side only, like those of *Sassafras*; they are 1 to 2 dm. long, 3-nerved, thin, the upper surface rough, the under side hairy. The small diœcious flowers open in May or June; the pistillate ones, composed of a tubular calyx, a stalked ovary with a two-cleft style, are borne in dense, round heads on one tree; the staminate ones, composed of a 4-cleft calyx, 4 stamens, and a rudimentary ovary, are borne in cylindric catkins on another tree. The ripe heads of pistillate flowers are from 1 to 2.5 cm. in diameter, the red individual drupes projecting beyond the calyx.



FIG. 326. — Paper Mulberry.

The fibrous bark is of value in paper-making and is one of the sources of the bark cloth or Tapa of the South Sea islanders. The wood is light in color and weight, even-grained but soft.

The generic name refers to the use of its bark in paper making.

IV. THE FIGS

GENUS **FIGUS** [TOURNEFORT] LINNÆUS



FIGUS is a very large and complex genus, consisting of some 600 species of trees, shrubs, or woody climbers, some of which are parasites on other trees. The sap is milk-like. They are widely distributed throughout the American tropics, from Florida to the Argentine Republic, but are especially numerous in the islands of the Pacific and in southern Asia. Some fossil species are recorded from the Cretaceous formations of Europe and from the Tertiary formations of North America.

They have thick leathery alternate, rarely opposite, deciduous or persistent, variously margined leaves. The stipules are interpetiolar and early deciduous. The flowers are monœcious, rarely diœcious, and borne on the inside of hollow receptacles which are variously situated and subtended, but are usually borne in the axils of leaves or leaf scars. Staminate and pistillate flowers are usually borne in different receptacles, but sometimes together. The staminate flowers are nearly sessile, their perianth 2- to 6-parted, sometimes wanting; stamens 1 or 2, rarely 3, the filaments erect, and united throughout their length when more than one; anthers innate or adnate, ovate, broad, nearly round, 2-celled, opening lengthwise; there is no trace of an ovary. The pistillate flowers have a narrower lobed perianth or rarely none; the ovary is sessile, 1-celled; the style is lateral, elongated, the stigma various, club-shaped, cylindric, peltate, or 2-lobed; ovary solitary, suspended or horizontal. The minute hard fruits are enclosed in the enlarged thickened and succulent receptacle.

The genus is of much economic importance. Besides the common Fig there are several others of great value. India rubber is produced from *Ficus elastica* Roxburgh, a native of Assam, which is also a much prized shade tree in the tropics; it is the well-known and popular India rubber plant of our conservatories and parlors. The Buddhists' sacred Peepul tree, *Ficus religiosa* Linnæus, is also an important and much valued shade tree, planted throughout tropical countries; several other species are also important and popular tropical shade trees. The name of the genus is the ancient classic name of the Fig tree, *Ficus Carica* Linnæus, which is the type species.

Our species are:

Leaves entire, smooth, evergreen; fruit small, globose, or obovoid, inedible.

Fruit sessile.

Fruit stalked.

Leaves lobed, rough and hairy; fruit large, pyriform, edible.

1. *F. aurea*.

2. *F. brevifolia*.

3. *F. Carica*.

I. GOLDEN FIG — *Ficus aurea* Nuttall

This tree starts into life as a parasite; the seed germinating in the crevices of the bark of other trees, produces aerial roots which, when they reach the ground, take root and become trunks; often several of these descend parallel, and surrounding the trunk of their host, finally come together and strangle it. The branches also send down roots, which, acting in the same way, produce additional trunks, and eventually form a compound tree, often covering a large area. Such a specimen near Miami is said to have covered a quarter of an acre of ground. This tree is abundant in hammocks of peninsular Florida, the Keys, the Bahamas, and grows also in Cuba, often reaching a height of 20 meters, with a trunk diameter of 12 dm.



FIG. 327. — Golden Fig.

The bark is about 12 mm. thick, gray or brown, smooth or scaly, and upon peeling off exposes the nearly black inner layers. The twigs are stout, thick and pithy, smooth, bright yellow, with pale lenticels, large leaf scars, and encircling stipule scars. The leaves are persistent, thick and leathery, oblong, oval or elliptic, 3 to 10 cm. long, sharp or short taper-pointed at the apex, entire on the margin, yellowish green, smooth and shining, with indented midrib above, pale, smooth and slightly shining, with yellow midrib, beneath. The leaf-stalk is short; the reddish stipules enclose the young leaves, which in falling leave nearly round scars. The receptacles are depressed-globose, sessile or nearly so subtended by several bracts, sometimes in pairs, with a small lateral opening near the top; the reddish flowers within it are separated by small scales, sessile or stalked. The perianth of the staminate flowers is 2- or 3-lobed; the stamens have stout flattish filaments somewhat longer than the perianth; anthers oblong. The pistillate flowers have a 4- or 5-lobed perianth, the lobes narrower than those of the staminate flowers, the ovary ovoid and sessile, with a slender style and 2-lobed stigmas. The fruit is obovoid, about 1.5 cm. in diameter, yellow to bright red when ripe, the nutlets light brown, the seed ovoid, rounded at each end.

The wood is soft, very weak, coarse-grained and light brown; its specific gravity is about 0.26. It is of no known economic value. The tree is sometimes planted as a shade or street tree in the southern States.

2. SHORT-LEAVED FIG — *Ficus brevifolia* Nuttall

This evergreen tree is rather rare in our area, occurring but sparingly in hammocks in peninsular Florida and the Keys, but is abundant in the Bahamas, and grows also in Cuba. It attains a maximum height of 15 meters, with a trunk diameter of 5 dm. Sometimes it is parasitic, like the foregoing tree, but usually its entire later career is terrestrial. It is also known as the Wild fig.

The branches are stout and spreading, sometimes producing pendent, aerial roots, the tree usually round-topped. The bark is about 10 mm. thick, smooth



FIG. 328. — Short-leaved Fig.

and light yellow-brown, sometimes separating in small scales and exposing the reddish brown inner layers. The twigs are round, rather stout and pithy, slightly hairy and reddish, becoming smooth, yellow-brown or red, and bearing quite prominent large leaf scars, and encircling stipule scars. The leaves are thin, leathery, ovate, oval or rarely obovate, 3 to 10 cm. long, sharp or taper-pointed or blunt at the apex, rounded or heart-shaped at the base, entire on the margin, deep green, smooth and shining with slightly impressed midrib above, paler and smooth, with a broad strong yellow midrib and prominent venation beneath; the leaf-stalk is slender, grooved, 1.5 to 2.5 cm. long; the

stipules are of a reddish tinge and enclose the young leaves; the receptacles are globose-obovoid, on stout stalks, 4 to 12 mm. long, subtended by deciduous bracts, usually single, occasionally in pairs. The flowers are sessile or stalked, intermixed with chaff-like scales, and similar to those of the foregoing species, except that the lobes of the perianth are broader in the pistillate flowers. The fruit is subglobose, 2 to 2.5 cm. in diameter, on stout stalks 0.5 to 2.5 cm. long, yellow at first, becoming bright red.

The wood is soft, close-grained, yellow or yellowish brown; its specific gravity is about 0.56.

This species has been confused with the similar *Ficus laevigata* Vahl (*F. populnea* Willdenow) of Porto Rico and the Windward islands.

3. COMMON FIG — *Ficus Carica* Linnæus

This well-known shrub or small tree is probably a native of the Mediterranean region, but it has been in cultivation from prehistoric times and has been so widely

grown for its fruit that its origin is quite uncertain. It has escaped to roadsides and fields in the warmer portions of our area, where it has become well established in some places. Its maximum height is about 9 meters.

The trunk is very short, the branches irregular, forming a roundish head. The bark is close, rather smooth, reddish or pale gray. The twigs are stout, pithy, hairy at first, becoming smooth, green or gray, and marked by leaf and stipule scars. The leaves are thick, firm and leathery, suborbicular or oval in outline, 5 to 15 cm. long, truncate or heart-shaped at the base, deeply 5- or 7-lobed; the lobes are broad or narrow, blunt at the apex and coarsely toothed or again lobed, very rough, hairy and light green above, pale and somewhat hairy beneath, the venation prominent on both sides; leaf-stalk stout, often as long as the blade. The receptacle is pear-shaped, short-stalked, subtended by several small broad bracts. The staminate flowers are rarely seen in the cultivated forms, but occur in the wild fig, which is called *Caprifig*, and is so different in appearance that it was thought to be a different species by the early botanists; the perianth is 3- to 5-lobed; stamens 1 to 5, usually 3, their filaments longer than the perianth. The pistillate flowers have a 3- to 5-lobed perianth; the ovary is superior, 1- or rarely, 2-celled, ovule 1, style lateral, tapering, much exceeding the perianth, forked into 2 stigmatic lobes. Receptacles that, owing to an imperfect ovary, do not produce seed, but are taken possession of by a small wasp-like insect, which establish their home in them, are called gall-flowers, while imperfect pistillate flowers, which neither produce seed nor become occupied by the fig insect, are called mules by fig growers. The fruit is usually obliquely pear-shaped, 5 to 7.5 cm. long, varying in color from white, through green and yellow to purple and brown, smooth, soft and fleshy; the seed-like nutlets are imbedded in the fleshy walls of the enlarged yellow and brittle receptacle, each containing a solitary suspended seed with a straight embryo in fleshy endosperm.



FIG. 329. — Common Fig.

There are over 400 varieties of Figs in cultivation, of which there are three classes, the ordinary Fig, which flowers twice in the year, producing fruits each time, whether the ovaries have been pollinated or not; the first crop is called *Early figs* or "*Brebas*," the second crop is called *Summer figs*. *San Pedro* figs produce but one crop, the early or *Brebas*; their second flowers are "*mules*," and produce no fruit. *Smyrna* figs will not produce fruit unless the ovary is pollinated; they produce perfect seeds, to which they owe their nutty flavor; they bear no staminate

flowers of their own, so the pollination is secured by placing branches of the Caprifig, upon which are staminate flowers and insects, among the branches of the Smyrnas when in flower, the insects passing in and out of the various receptacles causing the distribution of the pollen; this is called caprification.

The wood is soft, open-grained and spongy, rather strong and elastic, light yellow and light in weight. It is used in the Old World for hones, its porosity holding the emery or other abrasive substance placed upon it.

The Fig is sometimes planted for ornament and shade, as well as for its fruit, in warmer regions. Of the many species of its genus it is almost the only one producing edible fruit; but one other is known to produce an inferior, insipid fruit, which is sparingly used in its native region, namely, the Sycamore of the ancients, *Ficus Sycamorus* Linnæus, native of Africa, and cultivated for ages in Egypt; its wood is very durable and is said to be the material from which most of the caskets containing Egyptian mummies were made.

THE PROTEA FAMILY

PROTEACEÆ J. St. Hilaire



HIS family comprises some 50 genera, containing about 100 species of trees, shrubs or perennial herbs of the warmer regions of the southern hemisphere, being most abundant in southern Africa. They are of no special economic value; the seeds of several are eaten like nuts, either raw or roasted, the timber of some is of local importance, but they are grown widely for ornament or for their curious flowers.

The Proteaceæ have alternate, rarely opposite or whorled, simple or compound, usually hard and dryish leaves. The flowers are usually perfect, sometimes polygamous or dioecious; the perianth is in one series of 4 partly united divisions; stamens as many as there are parts of the perianth, upon which they are borne; the ovary consists of a single carpel, which is free and 1-celled, more or less oblique; style terminal; stigma disk-like, nipple-shaped or capitate; ovules 1 or 2. The fruit is dehiscent or indehiscent, often follicular or capsular; seed without endosperm.

One arborescent species has become adventive in warmer portions of our area.

SILK OAK

GENUS **GREVILLEA** ROBERT BROWN

Species **Grevillea robusta** A. Cunningham



AN Australian tree which has become spontaneous in Florida and California, having escaped from gardens, where it is cultivated for ornament and has reached a height of 20 meters. In its native home, however, it attains a height of 45 meters, with a trunk diameter of at least 9 dm.

The twigs are rather stout, very silky-hairy at first, becoming smooth and gray. The leaves are alternate, membranous and dryish, bi-pinnately parted, 2 to 4 dm. long, the segments narrow, entire or more or less incised on the margin and sharp or taper-pointed, light green and smooth above, pale or brownish silky-hairy with prominent veins beneath, the leaf-stalk long, channelled and abruptly thickened at the base. The flowers are golden-yellow and very showy, in terminal many-flowered panicles 1 to 2 dm. long; they are irregular but perfect; their perianth is oblique, its lobes elliptic or oval; stamens 4; anthers sessile or nearly

so; ovary stalked; the style is elongated and persistent; ovules 2, collateral. The fruit is a compressed, oblique, elliptic follicle, about 2 cm. long, recurved on its long slender stalk and tipped with the long slender style, dark brown and splitting open on one edge exposing the flat-winged yellowish seed.

The elastic wood of the Silk oak is valued in Australia for casks.



FIG. 330. — Silk Oak.

Seedling plants from 1 to 5 dm. high are much admired and are grown in great numbers by florists on account of their fern-like foliage and used as centerpieces for small fern dishes. In Florida and California the tree is grown for its general beauty and brilliant flowers, which are valued as a source of honey for bees. It grows rapidly in dry sandy soils.

The genus is a large one, comprising probably 200 species of shrubs or trees, mostly Australian. The name is in honor of Charles Francis Greville, an Englishman, prominent as a member of the Royal Society and a liberal patron of botany. The type species is *Grevillea punicea* R. Brown.

THE OLAX FAMILY

OLACACEÆ Lindley



LACACEÆ consist of about 24 genera, including some 120 species of trees, shrubs, or rarely shrubby herbs, some with twining stems, occurring throughout the tropical zone, but most abundant in the East Indies. They are of no economic importance. The typical genus, *Olax*, is composed of trees and shrubs of the Old World tropics.

The Olacaceæ have alternate, sometimes whorled, usually entire leaves, with no stipules. The flowers are perfect or polygamous, regular, axillary, in cymes, racemes, or solitary. The calyx is 4-lobed to 6-lobed, sometimes, however, it is a mere border to the hypogynous disk, which is free from or adnate to the ovary; the corolla is more or less tubular and 4-lobed to 6-lobed, sometimes of nearly distinct petals, inserted on the disk or on the receptacle, valvate in the bud; stamens 4 to 12, joined to the corolla tube, filaments distinct, rarely united, anthers oblong, introrse, opening lengthwise; the ovary is free or immersed in the disk, or partially inferior, 1- to 4-celled, its divisions often incomplete; styles mostly united; stigma entire, or 3- or 4-lobed; ovules 1 to 3 in each cell. The fruit is a drupe, naked or nearly enclosed in the enlarged disk, 1-celled and 1-seeded; the seed has a membranaceous coat, and copious fleshy endosperm, or rarely none; embryo small and straight.

The genera represented in our area are:

Branches unarmed; corolla-lobes short; stamens as many as the corolla-lobes; drupe nearly enclosed.

1. *Schæpfia*.

Branches armed; corolla-lobes long; stamens twice as many as the corolla-lobes; drupe nearly naked.

2. *Ximenia*.

I. WHITEWOOD

GENUS **SCHÆPFIA** SCHREBER

Species ***Schæpfia chrysophylloides*** (A. Richard) Planchon

Diplocalyx chrysophylloides A. Richard. *Schæpfia Schreberi* Small, not J. F. Gmelin



HIS small unarmed tree or shrub occurs on coral rock and in sand in peninsular Florida, the Keys, the Bahamas, Cuba, and Jamaica.

The branches are unarmed, crooked, and rather brittle. The twigs are slender, slightly zigzag, smooth, green, becoming ashy gray. The leaves are alternate, leathery, ovate or oblong-ovate, 2 to 6 cm. long, sharp or

blunt pointed, tapering or abruptly contracted at the base, entire on the margin, light green and smooth above, slightly paler beneath; the leaf-stalk is short and winged. The flowers are perfect, axillary, in clusters of 2 or 3, or solitary, pink or red; the calyx is cup-shaped, 2 mm. high, slightly dilated and entire-rimmed, almost filled by a fleshy disk; the corolla is leathery, narrowly bell-shaped, 4 mm. long, 4-ribbed, smooth; the 4 lobes are sharp-pointed and revolute; the 4 stamens are adnate to the base of the corolla-lobes, anthers sessile; ovary 3-celled, mostly immersed in the disk, style short, stigma 3-lobed.



FIG. 331. — White Wood.

The fruit is a scarlet ovoid or ovoid-oval drupe, 10 to 12 mm. long, almost entirely enclosed in the accrescent calyx; the seed is usually solitary in each cell of the crustaceous stone.

The genus contains about 15 species of trees or shrubs of the tropical regions of America and Asia; *S. Schreberi* Gmelin, of the Windward islands, is the type of the genus.

The name is in commemoration of Johann David Schoepf (1752-1800), a German physician and botanist, who traveled in North America and the West Indies.

II. TALLOWWOOD

GENUS **XIMENIA** [PLUMIER] LINNÆUSSpecies **Ximenia americana** Linnæus

THORNY small tree or shrub, which encircles the globe in the tropics, entering our area in peninsular Florida and the Keys, where it attains a maximum height of 6 meters. It is the type species of the genus. It is also called Seaside plum, Hog plum, Mountain plum, False sandalwood, and Wild olive.

The branches are thorny and spreading; the bark is close, smooth, reddish, and very astringent. The twigs are angular, becoming round and smooth. The leaves are alternate, or in clusters of 3, firm and leathery, oblong or elliptic, 3 to 7 cm. long, blunt or notched at the apex, tapering or rounded at the base, entire on the margin, slightly hairy when young, bright green and smooth above, paler beneath; the leaf-stalk is slender, grooved, 5 to 10 mm. long. The flowers are yellowish white and fragrant, perfect, in 2- to 4-flowered axillary clusters, on pedicels about as long as the leaf-stalk; the calyx is persistent, with 4 or 5 triangular sharp-pointed lobes; the corolla narrowly bell-shaped, leathery, 4-lobed, the lobes linear, with reflexed elongated tips; stamens 8, borne at the base of the ovary, their filaments thread-like, erect; anthers linear, opening lengthwise; ovary superior, sessile, ovoid-oblong, 3- or 4-celled, and smooth; styles united, as long as the calyx; stigma capitate; ovules 3 or 4 in each cell. The fruit, ripening in July, is a yellow or reddish, pulpy drupe, globose or broadly ovoid, 14 to 17 mm. in diameter, with an almond-like odor and acid taste. The stone is ovoid, about 2 cm. long, minutely pitted, light reddish brown, with a white seed. The fruit is edible, and is a favorite food of many birds.

The wood is hard, close-grained, yellow; its specific gravity is about 0.92. It is said to be used as a substitute for Sandalwood in the Eastern tropics.

The genus contains about 5 species of tropical trees or shrubs. The name is in honor of Franz Ximenes, a Spanish naturalist, writer on medicinal plants about 1615.



FIG. 332. — Tallowwood.

THE KNOTWEED FAMILY

POLYGONACEÆ LINDLEY



MOSTLY composed of herbaceous plants in the temperate zones, this large family, which includes over 30 genera and nearly 1000 species, contains a considerable number of trees and shrubs in tropical regions. The leaves are simple, mostly entire-margined, usually alternate, rarely opposite or whorled, and have characteristic sheathing united stipules (called ochreæ). The small regular flowers are variously clustered; the calyx is free from the ovary, lobed, or composed of separate sepals; there are no petals; there are from 2 to 9 stamens with slender filaments and 2-celled anthers; there is but one pistil, the 1-celled ovary containing 1 ovule and tipped by a 2-cleft or 3-cleft style. The fruit is an achene, usually invested or enclosed by the persistent calyx, which in the following genus becomes fleshy, so that the fruit often resembles a berry or grape.

This family yields a few valuable products. Among foods, Buckwheat, the seed of *Fagopyrum Fagopyrum* (Linnæus) Karsten, also produced by other species of Asiatic origin, is the most important. The popular Pie plant, or Rhubarb, is the leaf-stalk of *Rheum Rhaponticum* Linnæus, the root of which is also used as a purgative, but is very inferior to the official Rhubarb, which is the root of the Asiatic *Rheum officinale* Baillon. The roots and herbage of several species of the genus of well-known weeds, *Polygonum*, often called Smartweeds or Water peppers, are sparingly used in medicine; the roots of several species of *Rumex*, Docks, are employed as astringents; the root of *Rumex hymenosepalus* Torrey, called Canaigre is used in tanning; it is native of the southwestern States and Mexico.

I. THE GRAPE TREES

GENUS **COCCOLOBIS** PATRICK BROWNE



SOME 120 kinds of Grape trees are known, all natives of warm and tropical America, many occurring in the West Indies, two of which grow naturally also in southern Florida. Some of the species are low shrubs, but a number form tall trees, while a few are woody vines; all have simple evergreen, entire-margined leaves, with the characteristic stipular sheaths (ochreæ) of the family. The perfect small flowers are clustered in racemes and borne on short pedicels, which are jointed beneath the 5-lobed calyx; there are 8 stamens with rather slender filaments, borne at the top of the calyx-

tube; the ovary is bluntly 3-angled, the single ovule erect, and there are 3 styles. The fruit of most species has a thin fleshy pulp, though it is sometimes dry and crustaceous, containing a pit (achene) and crowned by the persistent calyx-lobes.

The generic name is from the Greek, signifying a berry with a husk. Three years after its publication by Browne, Linnæus modified the spelling to *Coccoloba*, *C. Uvifera* Linnæus being the type.

Our two species may be distinguished as follows:

Leaves orbicular or broader than long, cordate at the base; seacoast tree.

1. *C. Uvifera*.

Leaves oblong to obovate, narrowed or rounded at the base; tree of hammocks.

2. *C. laurifolia*.

1. SEA GRAPE — *Coccolobis Uvifera* (Linnæus) Jacquin

Polygonum Uvifera Linnæus

One of the most characteristic trees or shrubs of the tropical American seacoast, this interesting species is abundant on the shores of southern Florida, usually not exceeding 5 meters in height, but occasionally becoming 15 meters high, with a trunk up to 1.3 meters in diameter. When standing alone it presents a round mass, often broader than high. It is the typical species of the genus.

The thin bark is brown and smooth, mottled with lighter-colored areas; the stout young twigs are very finely hairy, yellowish, becoming smooth and gray. The leathery leaves are orbicular, or often wider than long, 2 dm. broad or less, rounded, notched, or short-pointed, the base deeply cordate; they are very short-stalked, their stipular sheaths membranous, 1 cm. long or less. The flowers are borne in small fascicles in elongated racemes, which develop almost continuously throughout the year, so that the tree is nearly always in flower; the flower-stalks are 3 or 4 mm. long and minutely hairy; the lobes of the bell-shaped calyx are white, ovate and rounded, about as long as the stamens. The clusters of fruit, which much resemble bunches of grapes, are conspicuous, each fruit being purple, globular, 1 to 2 cm. in diameter; the astringent pulp encloses the red pit.

The wood is very nearly as heavy as water, its specific gravity being 0.96, dark brown and hard. It is used in small quantities for furniture, and on the Windward islands much used for fuel. It is also called Horsewood and Hoopwood.



FIG. 333. — Sea Grape.



FIG. 334. — Sea Grape, San Juan, Porto Rico.

2. PIGEON PLUM — *Coccolobis laurifolia* Jacquin

An abundant element in the vegetation of hammocks and keys of southern Florida, this tree is also widely distributed in the West Indies from the Bahamas to northern South America, reaching a maximum height of about 20 meters, with a trunk up to 6 or 7 dm. thick or more.

Its smooth bark is thin, green, characteristically mottled with brown, the branches bluntly angular, the young twigs smooth. The leaves are ovate to obovate, pointed or blunt, 12 cm. long or less, or larger on young shoots, rounded or narrowed at the base, bright green on the upper side, paler on the under, short-stalked. The narrow racemes of flowers are 1 dm. long or less, the slender pedicels 5 to 8 mm. long; the bell-shaped calyx is 4 or 5 mm. broad, its 5 lobes nearly orbicular, and about as long as the stamens. The nearly globular ripe fruits are red, about 1 cm. in diameter, acid, ripening in early spring; the pit (achene) is hard and brown.

The wood is dark reddish brown, hard and strong, with a specific gravity of just about 1.00, being almost exactly as heavy as water.

Coccolobis floridana Meisner (*C. Curtissii* Lindau), also Floridian, differs from this by having short staminodes between the stamens, but this feature does not seem to us sufficient to separate it specifically.



FIG. 335. — Pigeon Plum.

THE FOUR O'CLOCK FAMILY

NYCTAGINACEÆ Lindley



HIS family, familiarly illustrated by the Four O'clock of our gardens, is mainly composed of herbaceous plants, but there are a few genera of trees and shrubs in tropical regions. In all there are some 17 genera and 250 species or more, widely distributed, but most abundant in temperate and tropical America. The flowers are quite large and showy, or very inconspicuous; the calyx is usually corolla-like, 4-toothed or 5-toothed, or sometimes lobed; there is no corolla; the stamens are hypogynous, with filiform filaments and 2-celled anthers; the ovary is enclosed by the tube of the calyx, 1-celled, containing 1 ovule. The fruit is either dry or somewhat fleshy, ribbed and grooved.

Only the following genus is represented in our arborescent flora.

BLOLLY

GENUS **TORRUBIA** VELLOZO

Species **Torrubia longifolia** (Heimerl) Britton

Pisonia discolor longifolia Heimerl. *Pisonia longifolia* Sargent



TORRUBIA comprises some 15 species of trees and shrubs, natives of tropical America.

The Blolly occurs in southern Florida, on the Bahama islands and in Cuba, growing usually within the influence of salt water, though also in hammocks a few miles inland, and reaches a maximum height of about 16 meters, with a trunk up to 5 dm. in diameter, usually much smaller, however, and often shrubby. It has been confused with *Torrubia obtusata* (Jacquin) Britton, a related species with much larger and thicker leaves, which grows on the Bahama islands.

Its thin brown bark is scaly, its smooth young twigs yellowish, turning gray. The smooth, mostly opposite leaves are obovate to oblanceolate, rather thick, rounded or occasionally notched at the apex, narrowed to a wedge-shaped base, 2 to 5 cm. long, the midvein prominent, the lateral veins ob-



FIG. 336. — Blolly.

scure; the slender leaf-stalks are 5 to 15 mm. long. The small greenish dioecious flowers are in small cymes, opening from April to November; the obconic or funnelform calyx is about 4 mm. long, with ovate pointed lobes, the stamens nearly twice its length. The oblong red fleshy fruit is narrowed at the base, 10-ribbed, not glandular, 5 to 7 mm. long.

The wood is yellowish, weak and soft, with a specific gravity of 0.65.

The generic name is in honor of Joseph Torrubia, a Spanish monk and naturalist. *T. opposita* Vellozo, of Brazil, is the type species.

The genus *Pisonia* Linnæus, differs from *Torrubia* in having a dry angular club-shaped fruit, with 5 rows of stalked glands. *Pisonia rotundata* Grisebach, of Florida, the Bahamas, and Cuba, is a shrub, and has been mentioned as forming a tree, but no satisfactory evidence that it is arborescent in Florida has come to our attention. *Pisonia aculeata* Linnæus, the type species of *Pisonia*, is a woody vine, armed with stout hooked spines, and occurs in Florida and throughout the West Indies.



FIG. 337. — Blolly on Great Inagua.

THE MAGNOLIA FAMILY

MAGNOLIACEÆ J. St. Hilaire



MAGNOLIACEÆ include about 10 genera, comprising some 85 species of trees and shrubs, widely distributed in temperate and tropical regions. Besides the trees here described, the North American flora contains two species of *Illicium*, shrubs of the southeastern States, and *Schizandra coccinea* Michaux, a climbing shrub or woody vine, ranging from North Carolina to Florida and Louisiana.

The Magnoliaceæ have alternate petioled leaves, stipulate, at least in the bud, and large solitary flowers. The sepals and petals are imbricated in whorls of three, hypogynous and deciduous, the petals often in two or three whorls, thus 6 or 9 in number; the stamens are numerous, borne on the lower part of the receptacle, which is often elongated, the pistils also numerous, borne above the stamens on the receptacle, ripening into an aggregate cone-like fruit, composed of many 1-seeded or 2-seeded follicles or achenes.

The aromatic and bitter principles pervading the sap of these plants have caused the use, particularly in the tropics, of the barks of a great many of them as tonic and febrifuge remedies; this application is quite local, however, except in the case of the so-called Star anise, the fruit of *Illicium verum* J. D. Hooker, of southeastern China noted for its anise-like odor, the volatile oil being used indiscriminately as oil of aniseed; the fruits of some of the species of this genus, especially *I. anisatum* Linnæus, of Japan, are very poisonous. Many of the plants are highly ornamental.

The two arborescent genera of our flora are:

Leaves not lobed; fruit a cone of fleshy follicles.

1. *Magnolia*.

Leaves 4-lobed or 6-lobed; fruit a spindle-shaped cone of dry carpels.

2. *Liriodendron*.

I. THE MAGNOLIAS

GENUS **MAGNOLIA** [PLUMIER] LINNÆUS



HIS genus includes some 25 species of trees and shrubs, natives of eastern North America, eastern and central Asia, southern Mexico, and the West Indies. All our species are trees with bitter bark.

The leaves are entire-margined, pinnately veined, their stipules (scales in the bud) falling away as the buds open. The large flowers are solitary at the ends of the branches, stalkless or short-stalked. There are three more or

less petal-like sepals which fall before the petals, 6, 9, or 12 petals, many stamens borne near the base of the long receptacle, their anthers linear, and numerous pistils, spicate or capitate on the upper part of the receptacle, the ovaries containing 2 ovules, the style short or slender. The fruit is a large cone of follicles; the ripe seeds are red and fleshy, hanging on long threads from the follicles.

Plumier dedicated this elegant genus to Pierre Magnol, who died in 1715, and was sometime Professor of Botany in Montpellier. Most of the species have merit as ornamental trees or shrubs, but they furnish scarcely any products of economic importance; the typical species is *Magnolia virginiana* Linnæus. The barks of most of the species have been used as tonics and febrifuges.

The North American species may be determined by the following key:

Corolla green to yellow; follicles not tipped.

Leaves elliptic to ovate, rarely obovate; flowers greenish yellow.

Leaves rhombic-obovate to nearly orbicular; flowers canary-yellow.

Corolla white; follicles tipped by the styles.

Leaves thick, leathery, brown-tomentose beneath, persistent.

Leaves thin to firm, glabrous, glaucous or silky beneath.

Leaves not auricled at the base.

Leaves firm, white-silky beneath; fruit 3 to 5 cm. long.

Leaves thin, becoming smooth beneath; fruit 6 to 9 cm. long.

Leaves auricled at the base.

Leaves pale green beneath; fruit oblong-conic.

Leaves elongated-obovate, gradually acute; stamens 9 to 13 mm. long.

Leaves rhombic-obovate, abruptly acute; stamens 4 to 6 mm. long.

Leaves white beneath; fruit subglobose.

1. *M. acuminata*.

2. *M. cordata*.

3. *M. grandiflora*.

4. *M. virginiana*.

5. *M. tripetala*.

6. *M. Fraseri*.

7. *M. pyramidata*.

8. *M. macrophylla*.

1. CUCUMBER TREE — *Magnolia acuminata* Linnaeus

This elegant tree, the common name of which is in allusion to its oblong fruit, which rather remotely resembles a cucumber, inhabits slopes and borders of streams from western New York and southern Ontario to Illinois, Arkansas, West Virginia, Georgia, and northern Mississippi, sometimes forming forests. It reaches a maximum height of about 30 meters, with a trunk up to 1.5 meters in diameter. It is also known as Mountain magnolia.

The dark brown thick bark is deeply furrowed. The young twigs are round, smooth, reddish brown, becoming gray-brown. The buds are 1 to 2 cm. long, oblong, bluntly pointed and finely white-hairy. The thin deciduous leaves are ovate, varying to

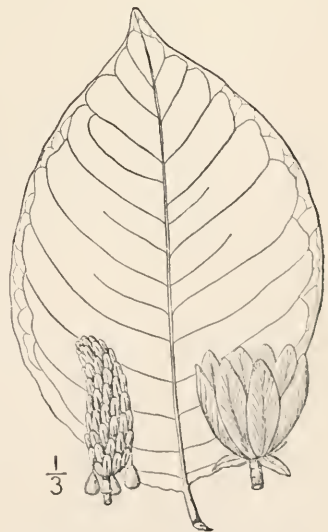


FIG. 338. — Cucumber Tree.

somewhat obovate, short-pointed, 1 to 3 dm. long, very hairy when unfolding, but become smooth and rather dark green on the upper side, but pale green and usually somewhat hairy on the under surface; the base varies from pointed to somewhat heart-shaped and the leaf-stalks from 2 to 4 cm. in length. The bell-shaped upright flowers open from April to June; the green sepals are oblong to oblong-lanceolate, blunt, spreading or reflexed, about 2 cm. long; the petals



FIG. 339. — Cucumber Tree, Carnot, Pa.

are greenish yellow, glaucous, concave, oblong or oblanceolate, blunt, 5 to 7 cm. long; the styles are slender. The ripe fruit is red, 6 cm. long or less, 2 to 3 cm. thick, often curved or contorted.

The tree is very desirable for lawn and park planting, forming a tall conic mass of foliage with widely spreading lower branches; it is quite free from insect and fungus pests, and stands the smoke of cities better than most of our native trees. Its wood is used locally for lumber, in cabinet work, and

for pumps, is yellowish brown, soft and rather weak, with a specific gravity of about 0.47.

On account of their slender deciduous styles, this species and the next are sometimes classed as a genus distinct from *Magnolia*, under the name *Tulipastrum* Spach.

2. HEART-LEAVED CUCUMBER TREE — *Magnolia cordata* Michaux

This tree, often regarded as a form or variety of the preceding species, is of very limited natural distribution, growing wild only in mountain woods from North Carolina to Georgia. It sometimes becomes 24 meters high, with a trunk about 1 meter in thickness.

Its bark is rough and furrowed, the buds, shoots, and young leaves silky-hairy, the twigs becoming smooth and gray. The leaves vary from broadly ovate to rhombic-obovate; they are dark green on the upper side, 2 dm. long or less, short-pointed, sparingly hairy on both sides, or smooth when old, the base heart-shaped, truncate or somewhat pointed. The bell-shaped flowers, which open in April, are canary-yellow, the sepals about 2 cm. long, spreading, the oblong or obovate petals 5 to 7 cm. long, blunt or bluntish. The fruit is about 7.5 cm. long and 2 to 2.5 cm. thick.

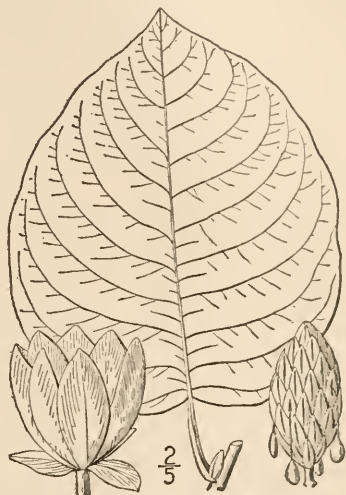


FIG. 340. — Heart-leaved Cucumber Tree.

The wood closely resembles that of the Cucumber tree, but is lighter in weight; its specific gravity being about 0.41, and owing to its rarity is not of economic importance. The tree is often cultivated and is of great beauty and interest.

3. BULL BAY — *Magnolia grandiflora* Linnæus

Magnolia virginiana fatida Linnæus. *Magnolia fatida* Sargent

The Bull bay, or Great laurel magnolia, is the largest leaved evergreen tree of our flora, and grows naturally in moist soil, especially along ponds and swamps, from eastern North Carolina to central Florida, westward through the Gulf States to Texas and Arkansas. It attains a maximum height of about 25 meters, and a trunk diameter of 5 meters, and when unimpeded by other trees is conic in form.

The thick rough bark is light brown, the young twigs round, covered with reddish hairs, but become smooth and gray; the buds are very hairy. The leaves are thick, leathery, persistent over winter until after the new ones unfold in the spring, 1 to 3 dm. long, pointed or bluntish, dark green, smooth and finely netted-



FIG. 341. — Bull Bay.

veined on the upper side, the under surface rusty-hairy, the base either narrowed or rounded; the thick leaf-stalks are 3.5 cm. long or less. The broadly bell-shaped flowers open from April to July or August, and are heavily fragrant; the creamy white sepals and petals are broadly obovate, notched, clawed, 7 to 10 cm. long and nearly as wide as long; the styles are stout and persistent, the ovaries densely hairy. The ripe fruit is oval, very hairy, 8 to 12 cm. long, the obovoid seeds 1.5 to 2 cm. long, somewhat flattened.

The wood has a limited use in carpentry and is good fuel; it is nearly white with a specific gravity of about 0.64, and rather hard. The tree is highly valued for decorative planting from Maryland southward, and in warm-temperate Europe.

4. SWEET BAY — *Magnolia virginiana* Linnæus, 1753

Magnolia glauca Linnæus, 1763

The Sweet bay, Swamp bay, or Laurel magnolia, known also as White bay, Swamp laurel, Swamp sassafras, and Beaver tree, while seldom over 8 to 10 meters high at the north, and there often flowering as a shrub, attains in Florida a height of 20 to 25 meters, with a trunk up to a meter in diameter or more. It grows in swamps from eastern Massachusetts to southern Florida, extending westward to Lebanon county, Pennsylvania, central North Carolina, and westward through the Gulf States to Texas and southern Arkansas. The base of its trunk is sometimes much swollen.

The old bark is thin and gray, that of young trees and branches pale gray or nearly white; the round young twigs are finely hairy, green, becoming reddish brown to gray. The leaves, which are deciduous in the autumn at the north, but persistent through the winter at the south, are oblong to elliptic, firm in texture, 5 to 15 cm. long, pointed or blunt at each end, pale and silky hairy when unfolding and remaining so on the under surface, but



FIG. 342. — Sweet Bay.

becoming bright green, smooth and shining on the upper; their stalks are 2.5 cm. long or less. The nearly globular white flowers are deliciously fragrant, opening from March to May in Florida, and in May and June farther north; the sepals are obovate or oblong, thin, 1.5 to 3.5 cm. long; the elliptic to obovate concave clawed petals are rather longer than the sepals, and are rounded at the apex; the styles are short and stout. The oval smooth red fruit is 3 to 5 cm. long.

The wood has a specific gravity of about 0.50, the white sapwood being much thicker than the darker heart wood; its use is limited to tool-handles and woodenware. The tree is well adapted for decorative planting, though of rather slow growth; several forms of it have received names in cultivation.

5. UMBRELLA TREE — *Magnolia tripetala* Linnæus

Magnolia Umbrella Lamarck

The clusters of large leaves at the ends of the branchlets, remotely resembling an umbrella, have given this tree its ordinary common name; it is sometimes called Elk-wood. The tree grows naturally in ravines and along streams or swamps in woods from southern Pennsylvania to Georgia, westward to Kentucky, Arkansas, and northern Mississippi.

It is usually a small tree, sometimes becoming 14 m. tall and with a slender trunk up to about 4 dm. in diameter. The thick bark is light gray and nearly smooth, the young twigs smooth, green, turning gray. The buds are narrow, long-pointed, glaucous, 4 cm. long or less. The leaves are narrowly obovate or broadly oblanceolate, thin, 7 dm. long or less, short-pointed, gradually narrowed to the base, the under side very velvety hairy when young but both sides smooth when old; their stout stalks are 2 to 4 cm. in length. The large white flowers appear in May and are unpleasantly odorous; the oblong-oblanceolate sepals are 10 to 15 cm. long, reflexed, and fall away early; the 6 or 9 oblong to oblanceolate blunt petals are clawed and somewhat longer than the sepals; the styles are stout and short. The fruit is oblong, rose-colored, 12 cm. long or less, and picturesquely beautiful in the autumn.

The Umbrella tree grows rapidly, is hardy as far north as central New York and is very desirable for lawn and park planting. Its wood is weak, soft brown at the heart, nearly white toward the bark, has a specific gravity of about 0.45, and is of little value.



FIG. 343. — Umbrella Tree.

Linnaeus, mistaking the 3 petal-like sepals for petals, gave the tree the inappropriate name of *tripetala*.

6. LONG-LEAVED UMBRELLA TREE — *Magnolia Fraseri* Walter

Magnolia auriculata Lambert



FIG. 344. — Long-leaved Umbrella Tree.

Inhabiting rich woods, mainly in the mountains from southwestern Virginia to Georgia, Kentucky, and Mississippi, this small tree often makes up a considerable portion of the forests, attaining a maximum height of about 15 m., with a trunk sometimes 5 dm. thick, the branches mostly spreading. Its thin bark is brown and nearly smooth, the round, smooth twigs reddish brown to gray, the narrow, smooth purple buds 2 to 4 cm. long. The leaves are clustered near the ends of branchlets, obovate-spatulate, thin, pointed or bluntish, 2 to 4 dm. long, with two blunt basal auricles; they are smooth on both sides, the upper surface dark green, the under pale green; the slender leafstalks are 3 to 7 cm. long. The white fragrant flowers open in May and June; the sepals are obovate, blunt, shorter than the petals, and fall away soon after the flower opens; the petals are 12 cm. long or less, elliptic to ovate, clawed, mostly blunt; the stamens are 9 to 13 mm. long; the fruit is oblong-conic, 12 cm. long or less, rose-colored, the beaked carpels yellow inside.

The tree does not lend itself well to cultivation in the open. Its wood is white, excepting the small brownish heart, is weak and soft, with a specific gravity of about 0.50. It is also known as Fraser's Magnolia.

7. RHOMBIC-LEAVED UMBRELLA TREE — *Magnolia pyramidata* Pursh

This tree, which inhabits woods and riverbanks in southern Georgia, northern Florida, and Alabama, is closely related to the preceding species, with which it has been confused. It attains a maximum height of only about 10 meters, with a trunk up to 2 dm. in thickness.

Its brown bark is thin and nearly smooth, the twigs reddish brown, turning gray, the long



FIG. 345. — Rhombic-leaved Umbrella Tree.

buds smooth and pointed. The thin leaves are rhombic-obovate, usually abruptly short-pointed, glabrous, 2.5 dm. long or less, with two basal, somewhat diverging auricles; they are bright green on the upper side, and paler underneath, their stalks 3 to 6 cm. in length. The white flowers open in May or June, and are smaller than those of *M. Fraseri* Walter, the lanceolate, pointed or long-pointed petals 5 to 8 cm. long, the stamens only 4 to 7 mm. long, the sepals oblong-obovate, abruptly pointed, early deciduous. The oblong rose-red fruit is 6 to 8 cm. long, the short-beaked carpels yellow within.

8. LARGE-LEAVED UMBRELLA TREE — *Magnolia macrophylla* Michaux

This, the largest leaved tree of the North American flora, inhabits woods, especially wooded ravines or valleys, ranging from Kentucky and North Carolina, to central Florida, westward to Arkansas and Louisiana, attaining a maximum height of 15 to 20 meters, with a trunk up to 5 dm. in diameter.

The thin pale gray bark is nearly smooth, the round, smooth twigs green, turning reddish or gray. The gigantic leaves are clustered toward the ends of the branches, thin, obovate to oblong-obovate, blunt or blunt-pointed, with two short, rounded auricles at the base, the upper surface deep green and smooth, the under side white-glaucous and more or less finely hairy, at least when young; the stout leaf-stalks are 15 cm. long or less, the midrib very prominent. The creamy white fragrant flowers are 2 to 3 dm. broad, opening from May to July, the bases of the ovate blunt petals purple or rose-colored within; the oblong to obovate blunt sepals are much shorter than the petals. The fruit is nearly globular, 6 to 15 cm. long, bright rose-colored, the carpels short-tipped.



FIG. 346. — Large-leaved Umbrella Tree.

The tree is very desirable for decorative planting, its enormous leaves and flowers being very striking. Its wood is brown at the heart, with yellowish sapwood, weak but hard, with a specific gravity of about 0.53.

II. TULIP TREE

GENUS *LIRIODENDRON* LINNÆUSSpecies *Liriodendron Tulipifera* Linnæus

THE Tulip tree, White-wood, Tulip poplar, Yellow poplar, White poplar, Blue poplar, Hickory poplar, Saddle-leaf, or Lyre tree, as it is variously called, the type of the genus *Liriodendron*, is the most characteristic tree of eastern North America, and also one of the largest and most interesting; it grows in woods from Rhode Island to southern Vermont, Michigan, and Missouri, south to Florida, Mississippi, and Arkansas, attaining a maximum height of about 60 meters, the trunk sometimes 3 meters in diameter or more.

The thick brown bark is irregularly ridged, the stout twigs reddish brown to gray, the blunt-pointed buds large, glaucous and smooth, their scales stipular to the leaves, falling away while the leaves are still young, except on seedling plants, where they are quite persistent. The alternate leaves are unique in form, smooth, broadly ovate or nearly orbicular in outline, truncate or broadly notched at the



FIG. 347. — Tulip Tree.

apex, 6 to 20 cm. long, with two apical lobes and 2 or 4 basal ones; they are shining bright green on the upper surface, paler and dull on the under side; the slender leaf-stalks are 10 cm. long or less, and the leaves quiver somewhat like those of the Aspens. The large, greenish yellow flowers are solitary at the ends of branchlets, opening in May or June; they have 3 reflexed petal-like sepals, 6 connivent clawed blunt petals, many stamens borne on the base of the long receptacle, and many pistils spiked on the upper part of the receptacle; the style is winged, the stigma small. The fruit is an oblong pointed cone 5 to 7 cm. long, the dry fruiting carpels imbricated on the receptacle, the axes of which remain on the trees after the carpels have fallen away.

The tree grows rapidly and is most desirable for shade or ornament on lawns or along highways. It is quite free from insect pests and the few leaf-fungi that live upon it are not noticeably detrimental. Its wood is soft, weak and brittle, light yellow to brown, with a specific gravity of about 0.42. It is easily worked and is very valuable, being used in large quantities for a variety of purposes, including construction of buildings, interior carpentry, furniture, shingles, and woodenware.

The genus is represented by only one other living species, a native of China (*Liriodendron chinensis* Sargent). Its geological history is extensive, fossil leaves of its ancestors occurring in the rocks from the Lower Cretaceous period to those of recent formation. The name is Greek, signifying a tree bearing lilies.



FIG. 348. — Tulip Tree, New York Botanical Garden.

THE CUSTARD APPLE FAMILY

ANONACEÆ de Candolle



HERE are some 46 genera of Anonaceæ, containing nearly 600 species, widely distributed in tropical regions of both the Old World and the New, a few only in the temperate zones. They have alternate entire-margined leaves without stipules. The flowers are solitary or clustered; there are 3 sepals and usually 6 petals, the latter in two series, the outer series mostly larger than and otherwise differing from the inner; there are numerous stamens and pistils. The fruit is large, mostly compound by the coalescence of the ripening ovaries, fleshy in our species.

This family produces very little that is of general economic importance, but many of its products are locally useful in the tropics, furnishing, as it does, many medicines, spices, and a large variety of edible fruits; best known of these are the Soursop, from *Anona muricata* Linnæus, of tropical America, the Sweetsop from *A. squamosa* Linnæus, cultivated in all tropical countries, also called Cherimoya, which name, however, should be applied to the Peruvian *A. Cherimoya* Miller. The Custard-apple, also called Bullock's heart, is the fruit of *A. reticulata* Linnæus. The popular perfume Ylang-ylang is extracted from the flowers of *Artabotrys odoratissima* R. Brown, of the Malay region.

The two genera of the arborescent flora of the United States are distinguished as follows:

Petals imbricated; fruit simple.

1. *Asimina*.

Petals valvate; fruit compound.

2. *Anona*.

I. NORTH AMERICAN PAWPAW

GENUS **ASIMINA** ADANSON

Species ***Asimina triloba*** (Linnæus) Dunal

Anona triloba Linnæus



SMALL tree or tall shrub, the type of the genus, which occasionally becomes 12 or 15 meters high and forms a trunk up to 2.5 dm. in diameter. It chiefly inhabits river valleys, and occurs from west central New Jersey to western New York, southern Ontario, Michigan, and Kansas, southward to Florida and Texas. It often forms dense thickets.

The thin smooth bark is dark gray to brown, with lighter colored blotches, the young twigs reddish brown, hairy, becoming smooth, the small buds densely hairy. The leaves are hairy when unfolding, but become smooth or nearly so, except on

the veins of the under side, where some of the brown pubescence is often retained until they are fully grown; they are rather narrowly obovate, 1 to 3 dm. long, abruptly short-pointed, narrowed to a wedge-shaped base, deep green on the upper surface, paler beneath; their stalks are only 5 to 10 mm. in length. The flowers are borne at leaf scars on twigs of the preceding season, and appear with the leaves from March to June, according to latitude; the 3 valvate sepals are broadly ovate, 8 to 12 mm. long, densely hairy; the 6 thick, strongly nerved petals, at first green, becoming purple, are in two series of 3, the outer ones ovate-orbicular, 2 to 2.5 cm. long, reflexed, larger than the erect inner ones; the stamens have short filaments and separated anther-sacs; the several pistils are borne on top of the globose receptacle. The fruits (berries) are very large, oblong-cylindric, 16 cm. long or less, about 4 cm. thick, yellow when ripe in the autumn, containing many dark brown flattened shining seeds horizontally imbedded in the edible pulp.



FIG. 349. — North American Pawpaw.

The tree is very desirable for decorative planting on account of its interesting leaves, which half-droop at an unusual angle, and also on account of its handsome flowers and fruit. Its wood is light yellow, weak and soft, with a specific gravity of only about 0.40.

About seven other species of *Asimina* grow in the southeastern States, especially in Florida, but they are all shrubs, though *A. obovata* sometimes attains a height of 3 meters. The genus does not exist in the wild state beyond the North American continent.

The generic name is from *assimin*, the aboriginal appellation. The common name, Pawpaw, is unfortunate, for the fruit bears scarcely any resemblance, except in color, to that of the Papaw or Papaya (*Carica Papaya* Linnæus) which grows in southern Florida and throughout tropical America, and the plants belong to widely different natural families.

II. POND APPLE

GENUS *ANONA* LINNÆUS

Species *Anona glabra* Linnæus



ANONA includes some 50 species of trees and shrubs, mostly aromatic, of wide distribution in warm and tropical regions. They have ever-green leaves and rather large, perfect flowers. The flowers have 3 valvate sepals and 6 valvate petals in two series of 3, the inner ones smaller than the outer; the receptacle is hemispheric; the numerous pistils are

borne on top of the receptacle, each containing a single ovule, and they coalesce in ripening into a compound fruit.

The generic name is said to be derived from the Malayan. The Soursop (*Anona muricata* Linnæus) of the West Indies and tropical America generally, is the type of the genus.



FIG. 350. — Pond Apple.

The Pond apple grows in ponds and swamps in southern Florida, and throughout the Bahama islands, where it is abundant in wet rocky sink-holes. It sometimes becomes 12 meters high, with a trunk 4 or 5 dm. thick, its base often much swollen and buttressed. The thin reddish brown bark is slightly fissured and scaly, the round brown twigs smooth, the buds small and pointed. The leaves are thick, oblong or ovate, 8 to 18 cm. long, bright green and somewhat shining on the upper side, paler and dull on the under surface, rather strongly netted-veined, the apex pointed, the base rounded or cordate, the stout leaf-stalks 1 to 4 cm. long. The nodding, short-stalked flowers are solitary in the axils of the leaves, 2 to 3.5 cm. long, yellowish, the 3 broad short sepals slightly united

at the base, about 6 mm. long, the thick outer petals a little longer than the inner ones. The fruit is ovoid, 13 cm. long or less, rounded at the top, its base depressed; it is yellow, or blotched with brown, the surface obscurely reticulated, the flesh insipid. The seeds are oblong, rounded at the top, 1 to 2 cm. long, enclosed by the thin aril.

The wood is brown, weak, soft, with a specific gravity of about 0.50.

THE LAUREL FAMILY

LAURACEÆ Lindley



COMPOSED wholly of trees and shrubs, most of them evergreen, this family has the genus *Laurus*, the true laurel for its type, containing two species, natives of the Mediterranean region, and not to be confounded with the many other evergreen shrubs and trees of other families popularly known as laurels. The Lauraceæ include some 40 genera and between 900 and 1000 species, widely distributed in warm and tropical regions, a few only in the temperate zones.

They nearly all have alternate thick leaves, usually entire-margined (*Sassafras* is an exception, having both entire-margined and lobed leaves). The flowers are small and variously clustered, perfect or imperfect, regular; the calyx is 4-lobed to 6-lobed; there is no corolla; the stamens are in three or four series of 3 each, borne on the calyx, some of them often sterile (staminodes), and their anthers open by valves to discharge the pollen; the ovary is free from the calyx, 1-celled, containing only 1 ovule; the style is usually short, tipped by a small stigma. The fruit is plum-like, one-seeded.

The aromatic nature of most members of this family renders them especially valuable as spices and stimulants, and a great many of them are locally so employed, especially in the tropics. A few, however, are poisonous and most all of them are ornamental. The Royal bay, *Laurus nobilis* Linnæus, of the Mediterranean region, has been employed for ages as an emblem of victory, and is largely used in warmer climates for ornament and shade, on account of its dense head of bright evergreen foliage; it is also used for ornament in cooler regions, where it is grown in large tubs and afforded protection in winter; its leaves and fruits are sometimes used for medicine and as a flavoring agent. Among the better known and more universally used products of the family, however, is Cinnamon, of which there are several kinds, generally named after the locality from which they come; it is the bark of several species of *Cinnamomum*, natives of the East Indies; the buds are also used under the name of Cassia buds. Camphor is a volatile substance obtained by distillation of the wood or twigs of *Cinnamomum Camphora* (Linnæus) Nees and Ebermair, a tree of Japan and Formosa; this tree is also planted for shade in southern California and the Gulf States. Another drug of great interest is Coto bark, of which there are two varieties, known as Veris coto and Para coto, the first being considered the best, but is almost unobtainable; both come from South America, but neither their botanical identity nor the trees from which they are secured are yet known; they are valuable stomachic remedies and have been lauded as specifics for Asiatic cholera.

Besides the trees here described, our flora contains the Spice-bushes (*Benzoin*), and the Pond-spices (*Malapoenna*), shrubs with deciduous leaves. Our tree genera are botanically distinguished as follows:

Flowers paniced, not involucre; leaves evergreen; flowers perfect.

Calyx-lobes persistent, the tube not enlarged in fruit.

Calyx-lobes deciduous, the tube enlarged in fruit.

Flowers racemose or umbellate, involucre.

Leaves deciduous, some of them lobed; flowers racemose, imperfect.

Leaves persistent, entire; flowers umbelled, perfect.

1. *Persea*.

2. *Ocotea*.

3. *Sassafras*.

4. *Umbellularia*.

I. THE RED BAYS

GENUS *PERSEA* GÆRTNER



PERSEA includes about 50 species, mainly trees, natives of warm-temperate and tropical America; they have entire evergreen leaves and small paniced, perfect flowers. The calyx is 6-lobed; there are 12 stamens, the inner series of three reduced to stalked, gland-like staminodes, the three outer series perfect with 4-celled and 4-valved anthers.

Fruit large, edible, 8 to 18 cm. long; introduced Mexican tree.

1. *P. Persea*.

Fruit small, less than 2 cm. long, inedible.

Young twigs glabrous or very sparingly hairy.

2. *P. Borbonia*.

Young twigs densely hairy.

3. *P. pubescens*.

1. ALLIGATOR PEAR

Persea Persea (Linnæus) Cockerell

Laurus Persea Linnæus. *Persea gratissima* Gærtner



FIG. 351. — Alligator Pear.

A native of Central America, this tree has been extensively planted and cultivated for its valuable fruit in all parts of tropical America, and it has run wild in southern Florida. It attains a maximum height of about 15 meters, with a trunk up to 6 dm. in diameter, and is the type species of the genus.

The rather thin bark is light gray and fissured. The young twigs are yellow-green, silky, becoming gray and smooth. The leaves are oblong to oval or obovate, rounded or narrowed at the base, hairy when young, smooth and finely netted-veined when old, 1 to 2 dm. long, their stalks 4 to 6 cm. long. The small, green flowers are in leafless hairy paniced small clusters, the inner sepals 4

to 5 mm. long, somewhat longer than the outer ones; the ovary is densely hairy. The fruit is oval or pear-shaped (Avocado of the Spanish), large, 18 cm. long or less, drooping, stalked, smooth, the thick, oily pulp delicious, and is now produced in considerable quantities in southern Florida.

The two following native species differ much from the Alligator pear in aspect, in the size and shape of the fruit, as well as in some features of the flowers, and have received the generic name *Tamala* Rafinesque.

2. RED BAY — *Persea Borbonia* (Linnæus) Sprengel

Laurus Borbonia Linnæus

The Red bay or Sweet bay, known also as Florida mahogany, Tisswood, and Laurel tree, inhabits moist soil from Virginia to Florida, Texas, and southern Arkansas, reaching a maximum height of about 25 meters, with a trunk sometimes a meter in diameter, often forming a considerable part of the forest.

The thick, dark brown bark is deeply fissured into small plates; the young twigs are brown, smooth, or slightly hairy. The leaves are oblong to oblong-lanceolate, 5 to 15 cm. long, pointed at both ends, bright green, smooth and shining on the upper side, pale and smooth or sparingly hairy on the veins of the under surface, very finely netted-veined on both sides; the reddish leaf-stalks are 1 to 2 cm. long. The flowers open from March to May and are borne in small stalked clusters in the



FIG. 352. — Red Bay.

leaf-axils, the stalks of the clusters smooth or nearly so, 1 to 2 cm. long; the yellowish white, finely hairy calyx is about 3 mm. long, the inner sepals two or three times as long as the outer, and about as long as the stamens, which have hairy filaments; the ovary is smooth, and ripens into a globular or obovoid blue or nearly black shining fruit, 1 to 1.5 cm. in diameter, seated upon the persistent calyx.

The wood, used to a limited extent in carpentry, is strong, hard, red, and has a specific gravity of about 0.64. The tree is desirable for lawn and park planting in the South.

Persea littoralis Small, a shrub or small tree, growing on sand-ridges in eastern Florida, is described as distinguishable from the Red bay by its relatively broader and shorter leaves, which are not netted-veined on the under side, and by its fruit, which has a bluish bloom, but it is not certain that these features are constant.

Persea humilis Nash, a shrub, or perhaps sometimes a small tree of inland peninsular Florida, differs from both in having the under side of the leaves silky-hairy.

3. SWAMP RED BAY — *Persea pubescens* (Pursh) Sargent*Laurus carolinensis pubescens* Pursh

This tree closely resembles the Red bay in general appearance and bark, but is usually smaller and not known to become more than 14 meters high nor to form a trunk more than 3.5 dm. in thickness; it is distributed from southeastern Virginia to Florida and Texas, growing in swamps or wet soil, near the coast, and grows also on the Great Bahama island.



FIG. 353. — Swamp Red Bay.

Its bark is usually thinner than that of the Red bay, and the young brown twigs are densely hairy. The leaves are elliptic, oval or lanceolate, 5 to 20 cm. long, pointed at both ends, sometimes long-pointed at the apex, rather bright green, smooth and shining on the upper surface, pubescent, at least on the veins, beneath; the leaf-stalks are 1 to 2 cm. long. The stalks of the axillary flower-clusters are 5 to 8 cm. long, densely velvety hairy, as well as the branches of the inflorescence, the short flower-stalks and the calyx; the inner sepals are 5 or 6 mm. long

and about twice as long as the outer ones, the stamens about as long, with hairy filaments. The oval or nearly globular dark blue fruit is 1.5 cm. in diameter or less.

The soft orange-brown wood has a specific gravity of about 0.64.

II. LANCEWOOD

GENUS *OCOTEA* AUBLETSpecies *Ocotea Catesbyana* (Michaux) Sargent*Laurus Catesbyana* Michaux

OCOTEA includes some 200 kinds of evergreen trees and shrubs, with entire-margined leaves, mostly natives of tropical America, a few in the Old World tropics, having its type species in *Ocotea guianensis* Aublet, of Guiana; the generic name was that used for this tree by the Indians of Guiana.

The Lancewood inhabits southern Florida and the Bahama islands, and is abundant in hammocks or coppices, becoming at least 12 meters high, with a smooth, somewhat angled or flattened trunk 3 dm. thick or less. The bark is

thin, light gray, the slender smooth round twigs brown, turning gray. The oblong to oblong-lanceolate leaves are 15 cm. long or less, pointed or long-pointed, smooth, dark green and shining on the upper surface, dull green, sparingly finely hairy or smooth on the under side, narrowed at the base, rather strongly netted-veined, their stalks 1.5 cm. long or less. The small perfect white flowers are numerous in axillary panicles, opening in March and April, their stalks 4 or 5 mm. long, reddish; the calyx is 2 or 3 mm. long in flower, its 6 lobes ovate-oblong and blunt; there are 12 stamens, shorter than the calyx, arranged in four series of 3 each, those



FIG. 354. — Lancewood.

of the inner or fourth series without anthers (staminodes), those of the third series bearing 2 glands on the filaments, those of the two outer series glandless and hairy; the style is short and cylindric. The fruit is a dark blue or nearly black drupe, globular or oval, 1.8 cm. long or less, borne on the persistent enlarged lower part of the calyx (hypanthium).

The tree is classified by some authors as *Nectandra coriacea* (Swartz) Grisebach, of the West Indies, and is certainly closely related to it. The wood is dark brown and hard, with a specific gravity of about 0.77.

III. SASSAFRAS TREE

GENUS **SASSAFRAS** NEES AND EBERMEIRSpecies **Sassafras Sassafras** (Linnæus) Karsten*Laurus Sassafras* Linnæus *Sassafras variifolium* (Salisbury) Kuntze.*Sassafras officinale* Nees and Ebermeir

THE name of this interesting tree is of Spanish origin. The genus is small, one other species existing in China, though the leaves of many of their ancestors have been found as fossils in rocks of recent geologic epochs. It inhabits dry soil, ranging from Massachusetts to Florida. Ontario, Michigan, Kansas, and Texas, sometimes reaching a height of 40 meters, with a trunk 2 meters in diameter or more.



FIG. 355.—Sassafras Tree.

The thick brown bark is rough and ridged in irregular layers, even on quite young trees. The young twigs are hairy, but soon become smooth; the buds are ovoid and pointed. The oval or oval-obovate leaves vary from entire-margined to 3-lobed, often with a lobe on one side only, and thus mitten-shaped; they are thin, pinnately veined, when young quite hairy but smooth when fully grown; their stalks are 2.5 cm. long or less. The imperfect, mostly dioecious flowers are yellow and about 6 mm. wide, borne in stalked umbelled racemes at the ends of twigs and open in April or May, before or with the unfolding of the leaves;

each umbel is subtended by several large bud-scales, which form an involucre to the flower-cluster; the calyx is 6-parted; the staminate flowers have three series of 3 stamens each, about as long as the calyx, or 9 stamens in all, those of the inner series bearing a pair of stalked glands at the base of the filaments; the pistillate flowers have 6 short sterile stamens (staminodes), an ovoid ovary, and a slender style. The fruit is an oblong-globose blue drupe 1 to 1.5 cm. long, seated in the enlarged, bright red calyx-tube.

The weak though durable wood is orange-brown, with a specific gravity of about 0.50, and is much used for fences. The tree grows rather rapidly and is very desirable for lawn planting, both on account of its beauty and its curious leaves and flowers. Oil of Sassafras, used in perfumery, is distilled from the roots and bark; the bark of the root and the mucilaginous pith of the twigs are used medicinally.



FIG. 356. — Sassafras, near Fort Lee, New Jersey.

IV. CALIFORNIA LAUREL

GENUS **UMBELLULARIA** NUTTALLSpecies ***Umbellularia californica*** (Hooker and Arnott) Nuttall*Tetranthera californica* Hooker and Arnott

ONE of the largest trees of the Laurel family, and, like the Sassafras, a monotype, this evergreen aromatic tree reaches a maximum height of about 30 meters, with a trunk up to 1.6 meters in diameter, ranging from Oregon to southern California, preferring moist soil, and being largest and most abundant in river valleys. The generic name is Latin, referring to the small umbels of flowers.



FIG. 357. — California Laurel.

The bark is thick and dark brown, its surface scaly. The young, greenish twigs are finely hairy, becoming smooth, yellowish to light gray. The leathery, oblong-lanceolate leaves are 5 to 14 cm. long, pointed at both ends, short-stalked, dark green on the upper surface, pale green beneath, finely netted-veined on both sides, and turn bright yellow in late autumn. The flowers, borne in small stalked axillary involucre umbels, are yellow, opening from January to May; the calyx is about 9 mm. long, 6-lobed, about as long as the perfect stamens, its lobes obovate or oblong and blunt; there are 9 perfect stamens in three series of 3 each, and 3 sterile inner stamens (staminodes); the ovary is smooth, containing 1 ovule; the style is nearly as long as the perfect stamens. The plum-like fruit is oval, 2 to 3 cm. long, yellowish green, with a

thin pulp and a large pit with a thin shell.

The tree is highly esteemed for planting within its natural range, and in countries of similar climate, but is not hardy in the eastern United States north of Charleston. The wood is largely used for furniture, in carpentry, for boats, and for woodenware of various kinds; it is light brown, strong and hard, with a specific gravity of 0.65. The fruit is said to have been eaten by the Indians and the leaves are sometimes used as a flavoring agent.

THE CAPER FAMILY

CAPPARIDACEÆ Lindley



HIS family includes some 35 genera and 400 species, or more, widely distributed, mostly natives of warm temperate and tropical regions. It comprises herbs, shrubs, and trees, with alternate or very rarely opposite, simple or palmately compound leaves, the flowers solitary or in cymes or racemes, either regular or quite irregular. There are 4 to 8 sepals and usually 4 petals; the receptacle is either short or elongated; the stamens are usually many, inserted on the receptacle, sometimes adnate to the stalk of the ovary, their anthers oblong; the ovary is 1-celled, containing many ovules borne in two rows on each of the two placentæ. The fruit is a capsule or a berry.

Only the following species is represented in our arborescent flora, but we have a number of herbs and a few shrubs.

The generic name *Capparis* is modified from the ancient greek appellation of the Caper tree of southern Europe, *C. spinosa* Linnaeus, the type of the genus, the flower-buds of which, pickled, are the capers much used as a condiment.

JAMAICA CAPER TREE

GENUS **CAPPARIS** [TOURNEFORT] LINNÆUS

Species ***Capparis jamaicensis*** Jacquin



SMALL tree which occurs on the Keys and adjacent mainland of southern Florida and on the West Indian islands, from the Bahamas to Jamaica and Barbadoes, growing to a height of 7 meters or more, with a trunk up to 2 dm. in thickness.

The thin reddish brown bark is somewhat furrowed, the angled and flattened young twigs densely brown-scurfy, this characteristic scurf covering also the pedicels, calyx, the pods, and the under side of the leaves. The thick oblong or oblong-lanceolate leaves are persistent through the winter, 10 cm. long or less, notched at the apex in all specimens seen from Florida, but often pointed in West Indian specimens, the base narrowed or rounded, the upper surface bright green, very smooth and shining; the stout leaf-stalks are 6 to 12 mm. long; when growing near or in water the tree produces water-shoots, which bear narrowly linear leaves, often 2 dm. long, and only 1 to 2 cm. wide. The large flowers are usually in 2's or 3's at the end of short peduncles in the axils of the upper leaves, the stout, angu-



FIG. 358.—Jamaica Caper Tree.

lar flower-stalks 5 to 12 mm. long; the 4 ovate to lanceolate sepals are pointed and about 1 cm. long; the 4 white petals are oblong, blunt, and about as long as the sepals, turning purple when old; there are 16 to 32 stamens, 5 cm. long or less, with filiform separate filaments, which are long-hairy near the base and purple; the ovary is borne on a smooth stalk 3 to 5 cm. long and ripens into a long, linear drooping, torulose, pointed pod 3 dm. long or less, and about 6 mm. thick.

The yellow wood is hard, with a specific gravity of about 0.70.

Capparis cynophallophora Linnæus, usually a straggling shrub, rarely over 3 meters high, the only other *Capparis* growing within our area has smooth, strongly-netted veined leaves and smooth

pod; it occurs in southern Florida and the West Indies.

THE HORSE RADISH TREE FAMILY

MORINGACEÆ Dumont

GENUS **MORINGA** LAMARCK

Species **Moringa Moringa** (Linnæus) Small

Guilandina Moringa Linnæus. *Moringa pterygosperma* Gærtner



MORINGA, or Horse-radish tree, the type of the genus *Moringa*, so called on account of the pungent taste and odor of its roots, is a native of India, has long been cultivated in tropical countries, and has escaped from cultivation in Florida and the West Indies. The family includes only the genus *Moringa*, of which 3 species are known, natives of Asia and Africa.

It is a small tree, sometimes 7 or 8 meters high, with corky bark and alternate pinnately decompound leaves; the very numerous leaflets are thin, opposite, oval to obovate, blunt, dull green, short-stalked, 2 cm. long or less. The showy, irregular fragrant flowers are in large axillary panicles; the cup-shaped calyx is 5-cleft; there are 5 unequal whitish petals and 5 perfect declined stamens with slender filaments, hairy toward the base, and 1-celled anthers, alternating with about as many sterile stamens (staminodia); the hairy ovary is 1-celled, containing many ovules and is tipped by a slender style; it ripens into a long, angled, pointed, drooping pod, 4.5 dm. long or less, and 1 to 2 cm. thick, containing numerous winged seeds.

The wood is soft, weak, and of little value. The tree is valued for its pods, which are eaten as a vegetable and pickled; Ben oil, much used by watch-makers, is expressed from its seeds.



FIG. 359. — Horse-radish Tree.

THE CUNONIA FAMILY

CUNONIACEÆ Lindley



CUNONIACEÆ include some 20 genera, made up of several hundred species of trees and shrubs, mostly natives of tropical and subtropical regions; the curious and interesting evergreen *Lyonothamnus* being endemic on the islands off the coast of southern California.

The trees and shrubs of this family have opposite leaves (rarely whorled), either simple or compound, with several or many leaflets; they have small stipules which fall away early. The flowers are small and regular, clustered, perfect, or in some genera imperfect; they have 4 or 5 sepals borne on an hypanthium and as many petals as sepals; the stamens are usually twice as many as the petals, or more, and are borne under the edge of a disk; there are usually 2 carpels, either separate, as in *Lyonothamnus*, or more usually united into a 2-celled ovary, which contains several or many ovules in two rows on the placenta. The fruits are small follicles or capsules.

LYON'S IRONWOOD

GENUS **LYONOTHAMNUS** ASA GRAY

Species ***Lyonothamnus floribundus*** Asa Gray

Lyonothamnus asplenifolius (Brandegee) Greene



LYONOTHAMNUS is a monotypic genus, restricted in distribution, so far as known, to the islands Santa Catalina, San Clemente, and Santa Cruz, off the coast of southern California, inhabiting rocky soil. It is a small tree, often a mere shrub, attaining a maximum height of about 13 meters, with a trunk up to 2.5 dm. in diameter.

Its bark is characteristic, separating in long thin reddish brown strips, which remain attached to the trunk for some time, finally falling away. The opposite leaves are either simple and entire, or pinnately compound or pinnatifid, when much lobed closely resembling those of the Sweet-fern (*Comptonia*); they are more or less hairy on the under side, smooth above, 15 cm. long or less, persistent. The numerous perfect white flowers are 6 to 8 mm. broad, in hairy, terminal compound cymes; the hemispheric hypanthium is 5-lobed, the lobes persistent; there are 5 broad, stalkless petals, 15 incurved stamens, about as long as the petals, borne on the disk that lines the calyx-tube, their filaments very slender, their anthers short, oblong; the two pistils are stalkless, each ovary 1-celled, containing 4 pendulous

ovules, the style stout, the stigma small. The fruit is a pair of quite woody glandular follicles, each containing 4 oblong seeds.

This rare and handsome tree is well adapted to cultivation in regions not subject to frost. Its wood is very hard, red, with a specific gravity of about 0.80.



FIG. 360. — Lyon's Ironwood.

Its leaves vary greatly, some pinnatifid and others entire-margined occurring on the same twigs on Santa Catalina island. The generic name is in honor of William S. Lyon, who explored Santa Catalina island in 1884-1885; he was an officer of the California Board of Forestry.

THE WITCH HAZEL FAMILY

HAMAMELIDACEÆ Lindley



AMAMELIDACEÆ comprise some 13 genera, containing nearly 40 species of trees or shrubs. They occur in eastern North America, Asia, and south Africa.

The leaves are simple, alternate, entire, toothed or lobed, stalked and stipulate; the flowers usually perfect, sometimes polygamous or monœcious, borne in various forms of clusters, either axillary or terminal, the perianth often imperfect and sometimes entirely absent; the calyx-tube, if any, is more or less adnate to the ovary and there are 4 or 5 sepals; petals, if present, 4 or 5 in number, elongated, and inserted at the base of the sepals; stamens 4 to 10; half of them are usually rudimentary; filaments distinct, anthers introrse; ovary 2-celled, composed of 2 carpels united at the base; styles 2, distinct, awl-shaped, erect or curved; stigmas simple; ovules usually solitary or sometimes more, suspended and horizontal. The fruit is a 2-celled, 2-beaked, woody or cartilaginous capsule, opening at the top; the seeds, 1 or several, shining, anatropous; embryo large and straight in fleshy to bony endosperm.

In addition to the arborescent genus that occurs in our area, the genus of shrubs, *Fothergilla*, known as Dwarf alder, which occurs only in eastern North America, from Virginia southward, is represented by three species.

WITCH HAZEL

GENUS **HAMAMELIS** LINNÆUS

Species ***Hamamelis virginiana*** Linnæus



HE Witch hazel, also called Witch elm, occurs throughout eastern North America from Nova Scotia to Ontario and Minnesota south to Florida and Texas; westwardly it extends into eastern Nebraska. As a shrub it is one of the most frequent of woody plants in this area, occurring in low, rich thickets and woodlands; southward it often becomes a tree, with a maximum height of 10 meters and a trunk diameter of 1 dm.

The trunk is short, the branches diverging irregularly and usually forming an open tree; the bark is about 5 mm. thick, light brown and scaly; the twigs are almost round, rather slender, and covered with rough brown hairs, but by autumn have become quite smooth, dark brown, and marked by a few light-colored circular spots; the winter buds are sharp-pointed, somewhat curved, light brown and

hairy. The alternate leaves are 7 to 15 cm. long, ovate to nearly orbicular, sharp or long pointed, seldom rounded, the very uneven base rounded or slightly cordate on one side and wedge-shaped on the other, the margin entire toward the base, more or less scalloped toward the end, the upper side dark green and quite smooth, the venation on the lower side prominently hairy; the leaf-stalk is short, the small stipules lanceolate. The flowers, which open in the autumn, during or after the falling of the leaves and the ripening of the previous year's fruit, are in clusters of 3 on short bracted peduncles at the axils of the leaves; calyx 4-parted, reflexed and hairy; petals 4, strap-shaped, crisped, 1.5 to 2.5 cm. long, bright yellow, but sometimes wanting; stamens 4, short, opposite the sepals, and alternate with 4 rudimentary stamens; the pistil consists of a woolly 2-celled ovary and a short, stigma-pointed style. The fruits, of which there are usually 2 in a cluster, are about 15 mm. long, and are ovoid thickened, woody, hairy, 2-beaked capsules, splitting open at the top, exposing a polished inner surface and ejecting, with considerable force, the suspended seeds, which are about 8 mm. long, smooth, nearly black, and shining.



FIG. 361. — Witch Hazel.

The wood is hard, close-grained, light brown; its specific gravity is about 0.68. The branches have long been in use as divining rods for the supposed detection of water and minerals. An aqueous distillation over the fresh leaves and twigs is largely employed as a popular application to sprains and bruises; the absence, however, of any active constituent save the minutest trace of a volatile oil, strongly indicates that its virtues, if any, reside in the small quantity of alcohol added for its preservation.

The generic name is Greek, having reference to the flowers and fruit appearing at the same time. In addition to the above-described species, which is the type of the genus, two others are known to occur in eastern Asia.

THE SWEET GUM FAMILY

ALTINGIACEÆ Hayne



ALTINGIACEÆ consist of probably 5 genera, with about 10 species of trees or shrubs of temperate or warmer regions of the Old and New World.

They have alternate leaves, which are deciduous or persistent, glandular-toothed, palmately lobed or entire, short or long-stalked, usually with deciduous stipules. The flowers are mostly monœcious, sometimes perfect, clustered in heads, surrounded by several deciduous bracts; they are without calyx or corolla. The heads of staminate flowers are in terminal racemes or panicles with numerous stamens intermingled with many small scales. The pistillate flowers are in solitary, long-stalked axillary heads, the pistil 2-carpelled; ovary partly inferior, containing several or many horizontal ovules in each carpel; stigma short, persistent or deciduous. The fruit is a hard, dry, many-capsuled head, sometimes armed with stout persisting stigmas; seeds of two kinds, the fertile, which are sparingly produced, being samara-like, or ovate, winged, and usually marked with resinous ducts, the straight embryo imbedded in the fleshy endosperm; the sterile seeds are very numerous, wingless, and angular.

SWEET GUM

GENUS **LIQUIDAMBAR** [CLAYTON] LINNÆUS

Species **Liquidambar styraciflua** Linnæus



THE Sweet gum is also called Bilsted, Star-leaved gum, Red gum, Liquidambar, and Alligator tree. It occurs from southern Connecticut to Florida, Ohio, Missouri, Texas and Guatemala, usually in wet, rich soil, bordering streams or swamps. It is a stately forest tree, reaching a maximum height of 45 meters, with a trunk diameter of 1.5 meters.

The branches are usually regular and spreading, forming a very symmetrical round tree when growing in the open; in the forest, however, the trunk is tall, slender and straight, the head narrow. The bark is deeply furrowed into broad, scaly ridges, 2.5 to 4 cm. thick, and gray-brown; on young trees and large branches it is thinner and dark gray; the bark of the branches frequently develops several wide, stratified corky wings often 2.5 to 4 cm. broad; the twigs are rather stout and pithy, obscurely angular, at first covered by rusty brown hairs, becoming

smooth, light brown, marked by broadly triangular leaf scars, and finally dark gray; the winter buds are scarcely 1 cm. long, sharp pointed, and covered by shining red-brown scales; the leaves are thick and firm, almost orbicular in outline, about 15 cm. across, deeply palmately cleft into 5, rarely 7, sharp-pointed, wedge-shaped, glandular-toothed lobes, bright green, smooth and shining above, paler beneath, the base usually heart-shaped; the leaf-stalk is about as long as the blade and slender; the stipules are small. The flowers, which appear when the leaves are about half-grown, are of two kinds; the staminate are borne in terminal up-



FIG. 362. — Sweet Gum, New York Botanical Garden.

right racemes 5 to 8 cm. long, consisting of several greenish globose clusters of many stamens commingled with elongated scales and subtended by an involucre of 4 deciduous bracts; the pistillate flowers are borne on slender drooping peduncles 2.5 to 5 cm. long, at the axils of the terminal leaves, in globular heads about 1.5 cm. in diameter, with a small involucre, and consist of many accrescent receptacles supporting 4 rudimentary anthers, and a partly inferior, 2-carpeled, 1-celled ovary with 2 stout incurved styles, with inner stigmatic surfaces. The fruit, which is persistent throughout the winter, is a spiny, globose, cone-like mass, 3 to 4 cm. in diameter, of a light brown color when ripe, becoming red-brown during the winter;

it consists of many imbedded woody capsules, which are capped by the persistent, woody, horn-like styles; the capsules split open at the top, exposing a polished inner surface and a solitary, flattened angular seed, rarely two, about 12 mm. long, with a short, ovate wing, together with many variously shaped imperfect seeds.



FIG. 363. — Sweet Gum.

The wood is hard, straight-grained, weak, light brown; its specific gravity is about 0.59. It polishes well, but warps badly. It is used to a small extent in carpentry. Its aromatic exudation and an extract of the bark are used at the south in catarrhal and stomachic affections, but are not usually articles of commerce.

The genus, of which this tree is the type species, received its name by a combination of Latin and Arabic, in allusion to the fragrant juice of these trees, of which there are two additional species in Asia.

Several fossil forms are known from the Miocene formations of Europe and America, extending far north into Greenland and Alaska.

As an ornamental tree the Sweet gum has few superiors, its rapid growth, freedom from disease or insect pests, symmetrical form, rich green leaves in summer, their gorgeous crimson autumnal coloration, and its striking silvery gray, corky-winged branches in winter, combine to make this one of the most desirable trees for park and street planting or for individual lawn specimens.

THE PLANE TREE FAMILY

PLATANACEÆ Lindley



HIS family of one genus with about 7 species, are trees of the north temperate zone. They are tall trees, with large, broad leaves and thin, light-colored, exfoliating bark. Several fossil forms, also, are known from the Cretaceous and Tertiary periods, being found as far north as Greenland.

The leaves are simple, alternate, palmately lobed, prominently veined, with long petioles, the hollow base of which encloses the bud for the following season; the stipules are large, entire or toothed. The flowers are monœcious, small and closely inserted on a globose, more or less fleshy receptacle, forming long-stalked heads, which are solitary, in spikes, or racemes; the perianth is very small, consisting of 3 to 6 outwardly hairy sepals and an equal number of thin, smooth petals; the staminate flowers are in axillary reddish heads; the stamens are 'as many as the sepals and opposite them; the filaments are very short, the anthers elongated; the pistillate heads are terminal and green, consisting of an equal number of small sepals and petals, with 2 to 8 distinct 1-celled carpels, mingled with rudimentary stamens (staminodes), and surrounded by persistent, long-jointed hairs; the style is terminal, and stigmatic for about half its length; the ovary is solitary, rarely 2, linear and 1-celled. The fruit is a globose, compact head, composed of many elongated inverted pyramidal nutlets, surrounded by stiff, erect hairs; the seed is pendulous, elongated, has fleshy endosperm, and a straight, linear embryo.

The name adopted by Linnæus for these trees is the Greek classic name of the European plane tree, *Platanus orientalis* Linnæus, the type of the genus. The common name Sycamore, most used for these trees in America, properly belongs to the Old World tree *Ficus Sycomorus* Linnæus, of the Fig family.

THE PLANE TREES

GENUS **PLATANUS** [TOURNEFORT] LINNÆUS.

Fruit heads solitary, rarely two together; eastern tree.

1. *P. occidentalis*.

Fruit heads racemose.

Lateral heads usually stalked; leaf-lobes elongated; southwestern tree.

2. *P. Wrightii*.

Lateral heads usually sessile; leaf-lobes relatively short; California tree.

3. *P. racemosa*.

I. SYCAMORE — *Platanus occidentalis* Linnaeus

This very large tree, also known as the Plane tree, Button wood, Button-ball tree, and Water beech, occurs from Maine and Ontario south to Florida, and westward to Nebraska and Texas. It is a frequent tree of low, rich lands, bordering streams. Its greatest development is attained in the valleys of the central States, often reaching a height of 55 meters, with a trunk diameter of 3.5 meters.

The trunk is often branched from near the base into several smaller trunks, or is greatly reduced by the very large, prominently outspreading branches, forming an irregular, open, and very broad head; on the edges of streams the trunk is often reclining or arching far out over the water, and then develops one or more tree-like, upright branches; in the east it is usually erect, and branched only above. The bark of old trees is 5 to 7 cm. thick, shallowly furrowed into broad ridges, which are broken up into thin plates of a dark brown color; on younger trunks and branches the bark is quite thin and spontaneously peels off into large, thin plates, exposing a smooth, light greenish gray inner layer. The twigs are rather stout; when young they are coated with pale hairs, but soon become smooth, brownish, and finally light gray. The winter buds are stout and blunt, about 10 mm. long. The leaves are orbicular in outline, 10 to 20 cm. across, 3-to 5-lobed, the lobes broad, long-pointed, and more or less toothed, the teeth separated by shallow rounded sinuses; they are truncate, heart-shaped, or rarely wedge-shaped at the base, very woolly when unfolding, but soon become smooth, except on the veins beneath, light green and firm; the stout leaf-stalk is one fourth to one third the length of the blade; the stipules are conspicuous, 2 to 4 cm. long and sharp-toothed. The stalks of the flower-heads are densely woolly. The fruit heads, usually solitary, rarely 2, are 2.5 to 4 cm. in diameter and light brown, hanging at the end of smooth, cord-like peduncles 7 to 15 cm. long, persisting on the branches until the following spring. The nutlets are 10 to 12 mm. long, slightly rounded at the top and usually capped by the short persistent style.



FIG. 364. — Sycamore.

The wood is hard, weak, not durable, coarse-grained, light brown, having a specific gravity of about 0.56. It is used to some extent for inside finishing of buildings and for furniture. Butcher's blocks, rollers, and chewing-tobacco boxes are largely made of it. The tree is undesirable for lawn or park planting, its young

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FIG. 365. — Sycamore, New York Botanical Garden.

leaves being killed in May or June by the minute fungus *Glocosporium nervisequum* Saccardo, though the second crop of leaves clothes the branches in July. The European species, *P. orientalis* Linnaeus, is less subject to this disease.

2. ARIZONA SYCAMORE — *Platanus Wrightii* S. Watson

This tree is also called the Arizona plane tree, but locally simply Sycamore. It is known only from the mountain cañons of southwestern New Mexico, southern Arizona and Sonora, at elevations of about 1800 meters. Its greatest height is 24 meters, with a trunk diameter of 1.5 meters.



FIG. 366. — Arizona Sycamore.

It much resembles the above described tree in bark and manner of branching. The twigs are slender, thickly woolly at first, but soon become smooth and light reddish brown or gray brown in color; the winter buds are conic, sharp-pointed, about 5 mm. long. The leaves are 15 to 20 cm. across, lobed to below the middle into 3 to 7 elongated wedge-shaped, sharp-pointed, or rarely rounded lobes, which are en-

tire or toothed; the base is usually heart-shaped, seldom truncate or wedge-shaped; they are thin, firm, light green, and smooth above, pale and hairy beneath; the stout, usually smooth leaf-stalk is 3 to 5 cm. long; the stipules are small, seldom over 10 mm. long, and usually entire. The flowering peduncles are covered with thick, whitish hairs. The fruit heads, of which there are from 2 to 5, are 2 to 3 cm. in diameter, and hang on a smooth, slender stem, 15 to 20 cm. long; the lateral heads are on stalks 2 to 2.5 cm. long. The nutlets are smooth, angular, about 6 mm. long, rounded at the top and capped by the short, curved, persistent style.

The wood is very similar to that of the previously described tree, except that it is considerably lighter in weight, its specific gravity being about 0.47.

3. CALIFORNIA SYCAMORE — *Platanus racemosa* Nuttall

Also known as the California plane tree, Button ball, and Button-ball tree, occurs from Alameda county, California to the mountains of Lower California, growing along the water courses, up to an elevation of 900 meters. Its maximum height is about 38 meters, with a trunk diameter of 2.7 meters.

In trunk, bark, and manner of branching it is similar to the other American

sycamores; the winter buds are conic, somewhat long-pointed, and about 8 mm. long. The leaves are 1.5 to 2.5 dm. across, 3- to 5-lobed to about the middle, the lobes wedge-shaped, sharply pointed, entire or toothed, usually cordate, sometimes truncate or wedge-shaped at the base, thick and firm, light green above, paler and woolly, especially on the venation beneath; the stout leaf-stalk is 2.5 to 7 cm. long, and hairy. The fruit-heads, of which there are 2 to 7, are 2 to 3 cm. in diameter, hanging on a smooth stalk 13 to 25 cm. long, the lateral ones being sessile or nearly so. The angular nutlets are somewhat tapering at the top and capped by the relatively long, curved, persistent style.



FIG. 367. — California Sycamore.

The wood is similar to that of the Arizona tree, except that it is slightly heavier, its specific gravity being about 0.49.

This is considered by many to be the most beautiful of all the native deciduous trees of the Pacific coast.

THE ROSE FAMILY

ROSACEÆ B. Jussieu



ABOUT 70 genera compose the family Rosaceæ, containing some 1200 species of herbs, shrubs, or trees, and a few vines; they are of greatly diversified habit and are widely distributed throughout the world.

The leaves are mostly alternate, rarely opposite, simple or compound, usually stipulate, sometimes conspicuously so. The flowers are regular, usually perfect, rarely diceious, variously disposed; the calyx free from or joined to the ovary, 4- to 9-lobed, usually 5-lobed, often bracteolate; petals of the same number as the lobes of the calyx or sometimes none; stamens few to many, their filaments distinct, the anthers 2-celled; pistils solitary or many, distinct, or adherent to the calyx; ovary 1-celled; styles terminal, lateral, or basal; ovules 1 to many in each cell and inverted. The fruit varies greatly, mostly follicular, sometimes drupaceous or nut-like, often raised upon or imbedded in an enlarged receptacle; endosperm of the seed usually wanting.

This family furnishes many of the most popular ornamental cultivated plants; also some of our most delicious fruits, such as the Strawberry, Raspberry, and Blackberry.

Two arborescent genera, with 6 species, occur in the western portion of our area:

Fruit a 5-celled, ovoid capsule; flowers many, in terminal panicles.

1. *Vauquelinia*.

Fruit a plumed nutlet; flowers in few-flowered clusters, usually axillary.

2. *Cercocarpus*.

I. VAUQUELINIA

GENUS **VAUQUELINIA** CORREA

Species ***Vauquelinia californica*** (Torrey) Sargent

Spiræa californica Torrey



BEAUTIFUL little tree, confined to a limited area in southern Arizona and adjacent Sonora and Lower California, where it is usually a shrub, but in the Santa Catalina Mountains of Arizona, at an elevation of about 1500 meters, it becomes a tree, attaining a maximum height of 6 meters, with a trunk diameter of 1.5 dm.

The branches are upright, stiff and crooked; the bark is about 2 mm. thick, reddish brown, and broken into small angular scales; the twigs are at first thickly clothed with pale hairs, brown, becoming brown-gray and marked by raised leaf

scars. The leaves are alternate, sometimes opposite, oblong to lanceolate, 4 to 8 cm. long, taper-pointed, or rarely rounded at the apex, abruptly wedge-shaped or rounded at the slightly unequal base, remotely glandular-toothed, leathery, bright yellowish green and smooth above, finely woolly and prominently net-veined beneath; the leaf-stalk is thick, grooved on the upper side, 8 to 12 mm. long; the deciduous stipules are very small and sharp-pointed. The flowers, which appear in spring, are borne in loose, branching panicles 5 to 8 cm. across, leafy below and bracteate above; the stalks are slender, whitish hairy; the persistent calyx is short, obconic, leathery, with 5 sharp erect lobes; the 5 petals are orbicular to oblong, reflexed and persistent; the 15

FIG. 368. — *Vauquelinia*.

to 25 stamens are in three or four rows, the outer row borne opposite the petals, those within being alternate; filaments equal or some shorter, awl-shaped; anthers 2-celled, opening lengthwise; the pistil is 5-carpeled, the carpels united below into a 5-celled hairy ovary terminated by 5 short, spreading styles with small terminal stigmas. The fruit is a woody, ovoid, 5-celled, hairy capsule 8 mm. long, subtended by the 5 conspicuous, light red, persistent petals; the capsules remain on the branchlets until the following season, finally splitting into segments tipped by the remnant of the style. There are two seeds in each carpel, terminated by an oblong wing.

The wood is hard, close-grained, dark brown, its specific gravity about 1.13.

This genus, of which *V. corymbosa* Correa, is the type species, is confined to western North America; two additional species are known; both Mexican shrubs or small trees. The name is in commemoration of the celebrated French chemist, Louis Nicolas Vauquelin, who died in 1829.

II. THE MOUNTAIN MAHOGANIES

GENUS **CERCOCARPUS** HUMBOLDT, BONPLAND AND KUNTH



CERCOCARPUS is composed of small trees or shrubs of the drier regions of western North America, where about 8 species have been detected.

The leaves are alternate, simple, mostly leathery, more or less persistent, with prominent spreading veins, short, stout leaf-stalks and adnate,

deciduous stipules. Flowers perfect, solitary, or in axillary or terminal clusters; the calyx-tube is long-cylindric, abruptly widened at the throat and 5-lobed, lobes spreading and deciduous, the tube persistent in fruit; there is no corolla; the stamens, of which there are 15 to 20, are in several rows on the lobes of the calyx, their filaments very short; anthers large and often hairy; pistil included in the calyx-tube, 1-carpeled, the style long, thread-like, and very hairy, terminated by a minute blunt stigma. The fruit is a dry, leathery, angular or ridged linear nutlet, enclosed in the persistent calyx-tube and terminated by the enlarged plumose style; the single seed is linear, pointed, and without endosperm.

The wood of all the species is of a reddish brown color, very hard, compact, and heavy. The name *Cercocarpus* is from the Greek, meaning tailed-fruit. The type species is *C. fothersgilloides* H. B. K., of Mexico.

The arborescent species of our area are:

Leaves dentate or serrate, at least toward the apex, or rarely entire.

Leaves prominently dentate.

Leaves glabrous or whitish-pubescent beneath.

Leaves densely woolly beneath.

Leaves dentate toward the apex or entire, obovate.

Leaves entire, their margins revolute.

1. *C. betuloides*.

2. *C. Traskiae*.

3. *C. breviflorus*.

4. *C. ledifolius*.

I. SCENTED MOUNTAIN MAHOGANY — *Cercocarpus betuloides* Nuttall

Although usually a shrub this frequently becomes a tree with maximum height of 9 meters, and a trunk diameter of 2.5 dm. It occurs in the mountains from southern Oregon to Lower California, and has been confused with the shrubby *C. parvifolius* Nuttall.



FIG. 369. — Scented Mountain Mahogany.

leaves, 7 mm. long; the woolly calyx is cylindric, its lobes narrow, obtuse; in

The branches are spreading or somewhat pendent. The bark is very thin, separating into irregular scales or flakes, which fall away in the autumn. The leaves are quite leathery, with a birch-like odor, 1.5 to 2.5 cm. long, obovate, wedge-shaped and entire below the middle, rounded and coarsely glandular-toothed above the middle, very hairy at first, soon becoming dark yellow-green, not hairy but roughish above, paler and with a few hairs near the prominent veins beneath; the channelled leaf-stalks are about 2.5 mm. long. The flowers are usually solitary in the axils of the

fruit it is spindle-shaped, slightly hairy, deeply cleft at the apex, and about 2 cm. long; the nutlet is grooved on the back, covered with dense, long hairs, its plume 6 to 8 cm. long.

The wood is close-grained, bright red-brown, and heavy; specific gravity about 0.93. It is sometimes used for tool-handles and turned articles, also much valued for fuel.

2. TRASK'S MOUNTAIN MAHOGANY — *Cercocarpus Traskiæ* Eastwood

This rare and very local tree has been found only on Santa Catalina island, off the coast of southern California, where but a small number of individuals, associated with several other trees of wide relationship, but equal rarity, occur. Its maximum height is 7.5 meters, with a trunk diameter of 3 dm.

The trunk is short and crooked; the branches are stout, irregularly outspreading, forming a picturesque tree; the bark is thin, smooth, light gray to brown, sometimes becoming transversely fissured. The twigs are stout, very hairy and red-brown, soon becoming roughened by leaf scars. The leaves are thick and leathery, oval to nearly orbicular, 4 to 6 cm. long, rounded, or seldom sharp-pointed at the apex, wedge-shaped, or sometimes rounded at the base, toothed by slender, gland-tipped teeth above the middle; they are densely woolly when young, becoming dark green, shining, and with impressed veins above, silky-white hairy, and prominently marked by the thick, oblique veins beneath; the hairy leaf-stalks are about 8 mm. long. The axillary flowers appear in March, in nearly sessile several-flowered clusters, which are very hairy throughout; the calyx-tube is smooth on the inner side; anthers short, oblong and hairy; in fruit the calyx is spindle-shaped, about 12 mm. long, deeply cleft at the top, light brown and long silky-hairy. The nutlet is somewhat ridged, about 10 mm. long, covered by white silky hairs, the plumose style about 5 cm. long.

The wood of Trask's mountain mahogany is hard, close-grained, light brown, and heavy.



FIG. 370. — Trask's Mountain Mahogany.

3. FEW-FLOWERED MOUNTAIN MAHOGANY — *Cercocarpus breviflorus* A. Gray

This small tree or shrub is confined to the high dry mountains near our southern border in western Texas, New Mexico, and eastern Arizona, extending southward into Mexico. Its maximum height is 7 meters, with a trunk diameter of 2 dm.



FIG. 371. — Few-flowered Mountain Mahogany.

The bark is about 3 mm. thick, slightly fissured, and scaly; the twigs are densely hairy, but soon become smooth and red-brown. The leaves are thick, oblong to obovate or elliptic, 1.5 to 2.5 cm. long, pointed or rounded at the apex, wedge-shaped below the middle; the entire, wavy or toothed margin is revolute; when young the leaves are densely whitish-hairy, but soon become grayish green above, paler beneath, and softly hairy on both sides; the venation is very prominent, especially on the under side; the leaf-stalk is stout, short, and usually reddish. The flowers are axillary, sessile or nearly so, usually solitary, sometimes 2 together; the calyx-tube is slender, about 5 mm.

long, its lobes short, rounded, and densely covered with whitish hairs; in fruit it is stalked, spindle-shaped, red-brown, smooth toward the cleft apex, 8 to 10 mm. long. The nutlet is nearly cylindric, covered with long whitish hairs, its plume projecting about 3 cm. beyond the tube.

4. MOUNTAIN MAHOGANY — *Cercocarpus ledifolius* Nuttall

A characteristic tree or shrub of the high dry slopes of the western sides of the Rocky Mountains and westward, at altitudes of from 1500 to 2700 meters, being found from Wyoming to Oregon, south to New Mexico and California, reaching at its greatest development a maximum height of about 12 meters, with a trunk diameter of 7.5 dm.

The trunk is short; the branches are stout and spreading; the bark of very old trunks is 2.5 cm. thick, reddish brown, deeply furrowed and scaly; the twigs are hairy and brown, becoming smooth, often with a bloom, and finally dark brown and roughened by numerous leaf scars. The leaves are crowded, thick and leathery, somewhat resinous, entire lanceolate to narrowly oblong, 1.5 to 3 cm. long, pointed at each end, the margin strongly revolute, quite hairy when young, but soon become smooth above, woolly and prominently veined beneath; leaf-stalk short and broad. The flowers are solitary in the axils of the leaves, 2 cm.

long; calyx hairy, its tube comparatively short, its lobes sharp-pointed; in fruit the calyx-tube is enlarged, 1.5 cm. long, cylindric, angular and hairy. The nutlet is cylindric, pointed at each end, somewhat angular, 7 mm. long, dark red-brown and covered with long hairs; plume 5 to 7 cm. long, more or less spirally twisted.



FIG. 372. — Mountain Mahogany.

The wood is close-grained, very hard but brittle, bright red or brown, and takes a fine polish; its specific gravity is about 1.07. It is highly valued as a fuel, and largely made into charcoal for use in the region in which it grows.

THE APPLE FAMILY

MALACEÆ Small



HIS family includes some 20 genera, containing several hundred species of trees and shrubs, which are of wide distribution in temperate regions. Their principal economic value lies in their fruits, such as the Apple, Pear, Quince, and Crab, grown in all temperate regions.

The leaves are alternate, simple, or pinnately compound, stalked, with free, deciduous stipules. The flowers are perfect and regular, solitary, racemose, corymbose or cymose; the calyx is superior, usually 5-lobed, the tube joined to the ovary; the petals equal the calyx-lobes in number and are usually clawed; stamens distinct, numerous, or rarely few; anthers small, 2-celled, opening lengthwise; the pistils are composed of 1 to 5 carpels, wholly or but partly united; ovules 1 or 2, rarely more, in each carpel, anatropous and ascending; the 1 to 5 styles are terminal and surmounted by small stigmas. The fruit consists of the greatly enlarged calyx-tube, which encloses the papery or leathery carpels, forming a more or less fleshy pome; the endosperm is wanting, the cotyledons fleshy.

Fossil leaves found in the Tertiary formations of Europe and America have been described as belonging to *Pyrus*, *Amelanchier*, or *Cratægus*.

The arborescent genera within our area are:

Carpels papery or leathery at maturity.

Leaves deciduous.

Leaf-blades pinnately compound.

1. *Sorbus*.

Leaf-blades simple.

Cavities of the ovary (carpels) same number as the styles.

Flesh of pome with grit-cells.

2. *Pyrus*.

Flesh of pome without grit-cells.

3. *Malus*.

Cavities of the ovary becoming twice the number of the styles.

4. *Amelanchier*.

Leaves persistent.

5. *Heteromeles*.

Carpels bony at maturity.

6. *Cratægus*.

I. THE MOUNTAIN ASHES

GENUS **SORBUS** [TOURNEFORT] LINNÆUS



ORBUS embraces about 11 species of trees and shrubs, inhabitants of the cooler portions of the northern hemisphere, over which they are widely distributed. They are of no economic importance, except for ornamental planting, as their properties are common to other members of the Apple family, and usually less pronounced than in many of them.

The leaves are alternate, pinnately compound, the leaflets saw-toothed, their stipules deciduous. The flowers are perfect, in compound cymes; the calyx-tube is obconic, shallowly 5-lobed, without bracts; the 5 petals are broadly rounded and contracted at the base into short claws; stamens many, inserted with the petals in the throat of the calyx; ovary inferior, its cells 2 ovuled; styles usually 3, distinct, and terminated by small blunt stigmas. The fruit is a small, usually red, berry-like pome, with soft, thin, cartilaginous carpels, each containing two small brown seeds.

The name applied to these plants by Linnæus is an old Celtic one, *Sorbus domestica* Linnæus, is the type species.

About 5 species of shrubs, in addition to the arborescent forms, have been described from western North America.

Leaflets smooth above, smooth or somewhat hairy beneath.

Leaflets hairy on both sides.

1. *S. americana*.

2. *S. Aucuparia*.

1. AMERICAN MOUNTAIN ASH—*Sorbus americana* Marshall

Sorbus sambucifolia Roemer, not Chamisso and Schlecht. *Sorbus americana decora* Sargent

This small tree, often only a shrub, occurs in moist or rocky woodlands, from Newfoundland to Manitoba and Iowa, southward in the mountains to North Carolina; its maximum observed height is 9 meters, with a trunk diameter of 5 dm.

The bark is smooth, 3 mm. thick, grayish, and irregularly roughened by small appressed scales. The twigs are stout, slightly hairy, soon becoming smooth, reddish brown, and marked by large triangular leaf scars; the inner bark is pleasantly odorous; the winter buds are sharp-pointed. The leaflets, of which there are 11 to 17, are membranous, lanceolate to oblong, 3 to 8 cm. long, sessile or nearly so, the terminal one stalked; they vary from long taper-pointed to short-pointed or blunt, are unequally wedge-shaped and entire-margined toward the base, sharply toothed with short-tipped or glandular teeth, slightly hairy at first, becoming smooth on both sides, yellowish green, with the midrib impressed above, paler, with midrib prominent, beneath; the petioles are slender and grooved, the stipules broad, nearly triangular and deciduous. The flowers expand in May or June; they are in dense, compound cymes 8 to 15 cm. broad, on short, stout pedicels; the calyx is obconic, 5-lobed, the lobes about one fourth as long as the white, nearly orbicular petals, which are about 3 mm. across. The



FIG. 373.—American Mountain Ash.

impressed above, paler, with midrib prominent, beneath; the petioles are slender and grooved, the stipules broad, nearly triangular and deciduous. The flowers expand in May or June; they are in dense, compound cymes 8 to 15 cm. broad, on short, stout pedicels; the calyx is obconic, 5-lobed, the lobes about one fourth as long as the white, nearly orbicular petals, which are about 3 mm. across. The

fruit ripens in late autumn, is globose or slightly pear-shaped, 4 to 8 mm. in diameter and bright red, its flesh acidulous; seeds about 3 mm. long, angular, rounded at the top, sharp-pointed at the base.

The wood is soft, close-grained, weak, and brown; its specific gravity is about 0.55. At the North the tree is occasionally planted for ornament and shade, and deserves more extended use in the cooler regions of our area. Young shoots sometimes bear leaves with deeply incised margins. The leaflets vary greatly in form.

2. ROWAN TREE — *Sorbus Aucuparia* Linnæus

This rapid growing tree, also called Mountain ash and Quick beam, is a native of Europe and Asia, extending far northward, where it becomes a small shrub.



FIG. 374. — Rowan Tree.

In our area it has long been planted for ornament, and has become sparingly naturalized in some of the north-eastern States and Canadian Provinces. Its maximum height is 18 meters, with a trunk diameter of 8 dm.

The branches are stout and spreading, forming an orbicular head; the bark is smooth or somewhat scaly, 6 mm. thick, dark gray; the twigs are hairy, grayish brown; the sharp-pointed buds are softly woolly. The leaves are odd-pinnate, with hairy petioles, and 9 to 15 leaflets, which are oblong to oblong-lanceolate, 2.5 to 7.5 cm. long, blunt or short pointed, the margin sharply toothed, except near the unequally rounded base, dull green above, paler beneath, hairy on both sides. The white flowers appear in June or July in compact woolly cymes, their calyx-lobes woolly; petals spreading, about 4 mm. across; stamens exserted, as long as the petals. The fruit is globose, about 10 mm. in diameter, bright red, and usually borne in great abundance.

The wood is hard, fine-grained, light brown; its specific gravity is about 0.83. It is used for tool handles and portions of machinery, as are most of the hard, non-splitting woods of the Apple family. In the days of the bow and arrow it was considered next best to the Yew for bows. The fruit is eaten in northern Europe and is also dried and ground into meal.

As an ornamental tree it has long been a favorite on account of its rapid growth, profusion of flowers, and showy fruit, which is much eaten by birds; many horticultural forms of it are known.

II. PEAR

GENUS **PYRUS** [TOURNEFORT] LINNÆUSSpecies ***Pyrus communis*** Linnæus

As an inferior fruited escape from orchards, the Pear is found in woods and thickets of the northeastern States. It is a native of Europe and Asia, attaining a maximum height of 20 meters, with a trunk diameter of 9 dm., and is the type of the genus *Pyrus*.

The trunk is straight, its branches are short, stout, and ascending, forming an oblong or conic tree; the small branches are frequently thorny; the bark is 5 to 8 mm. thick, shallowly fissured and broken into elongated loose dark brown or gray scales; twigs stout, nearly smooth, brownish red, with small yellow dots; winter buds blunt, rather large, and hairy at the tip. The leaves are alternate, thick and leathery, ovate, elliptic or obovate, 3 to 8 cm. long, sharp or taper-pointed, rounded at the base, margin finely toothed or entire, downy and hairy margined when young, becoming dark green, smooth and shining above, paler and smooth or nearly so beneath; the leaf-stalk slender, nearly as long as or sometimes longer than the blade. The flowers, opening in April or May, are 4 to 5 cm. across, borne on spur-like branches of the previous season in few to many-flowered cymes, on slender, usually downy pedicels 1.5 to 5 cm. long; the calyx-tube is urn-shaped and downy, the 5 lobes as long as the tube, sharp-pointed and hairy margined; the petals are white, nearly orbicular, rounded, contracted at the base; the stamens are numerous; the ovary is composed of 5 carpels, with 2 ovules in each cavity; the styles are more or less united at the base and terminated by small, club-shaped stigmas. The fruit of the wild tree is a pome about 5 cm. long, its flesh dryish, sour, astringent, and permeated by grit-cells, the carpels (the core) leathery, with two large brown seeds in each.

The wood is hard, close-grained, and reddish-brown; its specific gravity is about 0.82.

The Pear as an orchard fruit is too well known to need further mention.

The genus *Pyrus* contains about 12 species of trees or shrubs, all natives of temperate portions of the Old World. The name adopted for these trees by Linnæus is the ancient name of the pear.



FIG. 375. — Pear.

III. THE APPLES

GENUS **MALUS** [TOURNEFORT] HILL

MALUS embraces about 15 species of trees or shrubs, natives of the north temperate zone, over which they are well distributed.

The leaves are simple, alternate, toothed or lobed, and slender-stalked. The flowers, which are white to rose-colored and fragrant, are clustered in simple terminal cymes; the calyx-tube is urn- or bell-shaped, 5-lobed at the top; the petals, inserted at the mouth of the calyx-tube, are rounded at the apex, narrowed and clawed at the base; the stamens, about 20, are inserted with the petals in several rows and composed of stout filaments and rather large oblong yellow or purple anthers; the ovary consists of 5 carpels, or sometimes but 2 or 3, united at the base, free at the top, and terminated by slender, stigmatic pointed styles; ovules 2 in each cavity. The fruit is a large globose pome, usually depressed, and hollowed at the base, with thick juicy flesh free of grit-cells; its papery or leathery carpels, forming the "core," are joined at the top, but free in the middle, containing 2, sometimes but 1, large, ovoid, pointed, shining brown seeds.

The name *Malus* is the Greek name of the Apple, which is the type of the genus

The species occurring in our area are:

Fruit impressed at the base; calyx-lobes persistent.

Leaves glabrous, at least where mature.

Leaves oblong, lanceolate or oval, mostly narrowed at the base.

1. *M. angustifolia*.

Leaves ovate, cordate or rounded at the base.

2. *M. coronaria*.

Leaves persistently pubescent or tomentose beneath.

Leaves mostly narrowed at base; pome 2 to 4 cm. in diameter. Native trees.

Pedicels stout, hairy, 1 to 2.5 cm. long.

3. *M. iænsis*.

Pedicels slender, smooth, 2 to 4 cm. long.

4. *M. Soulardi*.

Leaves rounded or subcordate at the base; pome 5 to 10 cm. in diameter. Introduced European tree.

5. *M. Malus*.

Fruit rounded at the base, oblong; calyx-lobes deciduous.

6. *M. diversifolia*.

1. NARROW-LEAVED CRAB APPLE — ***Malus angustifolia*** (Aiton)

Michaux

Pyrus angustifolia Aiton

This is a beautiful small tree, often forming dense thickets, from New Jersey to Kansas, south to Florida and Louisiana. Its maximum height is 9 meters, with a trunk diameter of 3 dm.

The branches are stiff and spreading, forming a broad, round tree; the bark is about 5 mm. thick, rather deeply fissured into narrow ridges, and broken into small, persistent, reddish brown scales; the twigs are slender, pale-hairy, soon be-

coming smooth and brown, producing slender, spur-like branches; the winter buds are small, blunt and brown. The leaves are thick and leathery, oblong, oblong-lanceolate or ovate, 2 to 5 cm. long, sharply or bluntly pointed, narrowed at the base, margin toothed or entire, dark green and shining with impressed midrib above, paler and nearly smooth beneath; leaf-stalk slender, usually smooth, 2 to 2.5 cm. long. The flowers are rose-colored and very fragrant, appearing from March



FIG. 376. — Narrow-leaved Crab Apple, Carnot, Penn.

to May, 2 to 2.5 cm. across, in few-flowered cymes, on slender, somewhat glandular pedicels 2 to 4 cm. long; the calyx-tube is urn-shaped, the lobes triangular, sharp-pointed, persistent on the fruit; petals narrowly obovate, rounded, wavy or irregularly toothed; ovary and base of styles pale woolly, the latter nearly distinct. The fruit is nearly globular, 2.5 to 3 cm. in diameter, 2 to 2.5 cm. high, impressed at the base and apex, dark green and roughish, fragrant, the flesh hard and very sour.



FIG. 377. — Narrow-leaved Crab Apple.

The wood is hard, close-grained, light reddish brown; its specific gravity about 0.68. It is sometimes used in the manufacture of tools, handles, and portions of machinery. The tree is also called Southern crab apple.

The fruit is used for jellies and cider. This is one of the most charming of North American trees on account of its abundance of showy, fragrant flowers.

2. AMERICAN CRAB APPLE

Malus coronaria (Linnæus) Miller

Pyrus coronaria Linnæus

Also called Sweet crab, Fragrant crab and Scented crab, this small tree is quite abundant, often forming dense thickets, from Ontario to Michigan, South Carolina, Missouri, Alabama and northern Louisiana. It often attains a height of 9 meters, with a trunk diameter of 3.5 dm.

The trunk is short, its branches slender, spreading, often crooked, forming a broad, round-headed tree; the bark is about 10 mm. thick, reddish brown, furrowed and scaly; the twigs are white-woolly, soon becoming smooth or nearly so, red-brown and finally light brown and bearing spine-like spurs; the winter buds are small, blunt and bright red; the leaves are membranous, ovate or sometimes nearly triangular, 3 to 8 cm. long, usually sharp-pointed, rounded or slightly heart-shaped at the base, margined by sharp glandular teeth, or often lobed, red-brown and velvety beneath when unfolding, soon becoming quite smooth, bright green, with impressed veins above, paler, smooth or nearly so, and prominently veined, beneath, the slender, somewhat glandular leaf-stalk 4 to 5 cm. long. The very fragrant flowers, appearing in May, when the leaves have fully expanded, are rose-colored, seldom white, 4 to 5 cm. across, in few-flowered cymes, on slender smooth pedicels 1.5 to 4 cm. long; the calyx-tube is urn-shaped, hairy, the lobes long, sharply pointed, hairy on the inner surface; petals obovate, rounded, sometimes toothed or wavy margined; stamens shorter than the petals; ovary and base of styles hairy. The fruit ripens late in autumn and remains hanging on the long, slender stalks for some time; it is de-



FIG. 378. — American Crab Apple.

pressed-globose, 2.5 to 3.5 cm. in diameter, 2 cm. high, the basal hollow broad and shallow; it is yellowish green and fragrant, covered by a sticky secretion; flesh firm, translucent and very acid; seeds large, oval and dark brown.

The wood is very similar to that of the Narrow-leaved crab, except that it is heavier, its specific gravity about 0.70. The fruit is also used for jellies and for cider, and, like the former species, it is a most desirable ornamental small tree.

3. WESTERN CRAB APPLE — *Malus ioensis* (Wood) Britton

Pyrus coronaria ioensis Wood. *Pyrus ioensis* Bailey

A small tree with stout spreading branches, resembling the preceding species. It is the common Crab apple of the central States, from Minnesota and Wisconsin south to Kentucky and Texas. Its maximum height is 9 meters, with a trunk diameter of 4.5 dm.

The bark is about 9 mm. thick and broken up into elongated, persistent scales of a red-brown color; the twigs are densely white-woolly when young, becoming nearly smooth, dark gray or brown; the leaves are rather thick and firm, ovate or oblong, 3 to 8 cm. long, blunt or pointed at the apex, narrowed or rounded at the base, blunt-toothed, scalloped or somewhat lobed on the margin, white-woolly, becoming dark green and smooth above, but remaining pale and woolly beneath; leaf-stalk stout, hairy, 2 to 5 cm. long. The flowers, appearing in April or May, are 4 to 5 cm.



FIG. 379. — Western Crab Apple.

across, on slender, hairy pedicels 2.5 to 3.5 cm. long; calyx-tube white-woolly, as are its narrow, sharp-pointed lobes; styles united and hairy for some distance from the base. The fruit is borne on a stout, hairy stalk 2 to 4 cm. long; it is depressed-globose, 3 to 5 cm. in diameter, 2.5 to 3.5 cm. high, with the persistent calyx in a shallow depression, the basal hollow narrow; it is yellow-green, fragrant, and sour.

The Western crab apple is one of the handsomest of the American crab apples, and should be more frequently planted in parks and large gardens. A double-flowered form, known as Bechtel's crab, is a magnificent object, with its large, double rose-colored flowers, and is often seen in our parks and gardens.

4. SOULARD CRAB APPLE—*Malus Soulardi* (Bailey) Britton*Pyrus Soulardi* Bailey

A small, stout, upright tree, similar to the other American crab apples in form and flowers, but in fruit it rather resembles the common apple and is considered by some authors to be a natural hybrid of it and one of the native species. It occurs but sparingly from Minnesota southward to Texas.

The bark is scaly and brownish; twigs stout, densely white-woolly at first, becoming smooth, red-brown and finally dark gray-brown; winter buds small, red-brown, the scales hairy-margined. Leaves rather thick and wrinkled, ovate-elliptic or obovate, 3 to 8 cm. long, mostly blunt at the apex, rounded or somewhat heart-shaped at the base, irregularly scallop-toothed or occasionally lobed, woolly when young, when old bright green and smooth or nearly so above, woolly beneath; leaf-stalk woolly, 2 to 2.5 cm. long. The flowers, appearing in May, are 5 cm. across,



FIG. 380. — Soulard Crab.

rose pink, in rather dense cymes, on slender hairy pedicels; the bell-shaped calyx is white-woolly, its lobes long, sharp-pointed, hairy; stamens large, orange-colored. The fruit is flat-globose, about 5 cm. in diameter, 3 cm. high, suspended on smooth, slender pedicels 2 to 4 cm. long, greenish yellow, fragrant, the flesh firm and less acidulous than that of the other American crab apples, its basal hollow broad.

It is cultivated in the north central States for its fruits, which are highly praised for cider and jellies, being used as a substitute for the Quince, where that fruit will not thrive, and is also planted for ornament.

The Siberian Crab apple, *Malus baccata* (Linnæus) Borekhausen, much cultivated for its fruit, has become spontaneous in northern New England; its fruit is but little hollowed at the base, crimson to yellow.

5. APPLE—*Malus Malus* (Linnæus) Britton*Pyrus Malus* Linnæus

This well-known fruit tree is a native of western Asia, and is a frequent escape to woods, thickets, and roadsides of the eastern United States; its maximum height is about 12 meters, with a trunk diameter up to 9 dm.

The trunk is usually short, with outspreading branches, forming a broad,

round-headed tree; the bark is 8 to 10 mm. thick, brown-gray, and broken into small irregular thin flat plates. The twigs are rather stout, densely hairy, light green, becoming reddish or purplish brown, finally smooth and dark gray-brown; the winter buds are large, blunt and hairy; the leaves are thick, somewhat fleshy, broadly ovate to oval, 2 to 5 cm. long, blunt or abruptly pointed, rounded or somewhat heart-shaped at the base, margin toothed or nearly entire, dark green, smooth or nearly so above, hairy or woolly beneath; leaf-stalk hairy, as long as the leaf-blade or nearly so. The flowers are white or pinkish, 3 to 8 cm. across, in few-flowered cymes, on stout, woolly pedicels 2 to 5 cm. long; calyx-tube urn-shaped, very woolly, as are its lobes, which are narrowly triangular and sharp-pointed; petals broadly obovate, rounded at the apex and usually entire; styles hairy. The pome is depressed, globular, or rarely elongated, with persistent calyxlobes at the top, hollowed at the base, 2 to 8 cm. in diameter; flesh of wild fruit usually coarse and sour.



FIG. 381. — Apple.

The wood is hard, close-grained, red-brown; its specific gravity is about 0.80. It is used in the manufacture of tools and machinery. As a fruit and ornamental tree it is too well known to require further description; some of the dwarf and double-flowered forms should be more often seen in private grounds and public parks.

6. OREGON CRAB APPLE—*Malus diversifolia* (Bongard) Røemer

Pyrus diversifolia Bongard. *Malus rivularis* Røemer. *Pyrus rivularis* Douglas

This small tree or shrub occurs in rich moist lands along streams from Alaska southward to central California, attaining its greatest development in Washington and Oregon, where it reaches a maximum height of 12 meters, with a trunk diameter of 4.5 dm. usually much smaller, however, and often forming thickets.

The bark is about 6 mm. thick, broken into thin, loose, reddish brown plates; the winter buds are small, blunt and brown; twigs hairy, gradually becoming smooth, bright red, shining, and finally dark brown. The leaves are firm in texture, ovate to ovate-lanceolate, 2.5 to 8 cm. long, sharp or taper-pointed, narrow, rounded or subcordate at the base, margined by short, sharp, glandular teeth, sometimes 3-lobed, dark green and smooth, with impressed venation above, pale, slightly hairy or smooth, and prominently veined beneath; leaf-stalk stiff,

stout, hairy, 2.5 to 4 cm. long. The flowers are 15 mm. across, in short racemose leafy-based cymes, on slender, hairy, glandular or smooth pedicels; the calyx-tube is obconic, smooth or nearly so, the lobes are small, sharp-pointed, very woolly on the inner surface, deciduous in fruit; the petals are obovate to orbicular, irregularly toothed or wavy margined; styles smooth. The fruit ripens from August to October, is obovoid-oblong, about 8 to 10 mm. in diameter, often twice as long, yellow to red; the flesh is thin, dry, pleasantly acidulous; the seeds are relatively large.



FIG. 382. — Oregon Crab Apple.

it for winter use. The wood is hard, close-grained, satiny, and pinkish red; its specific gravity is about 0.83; it is made into mallets and tool handles. The fruit differs from typical apples in not being sunken in at the base. *Malus Macounii* Greene, of British Columbia, is, in our judgment, a form of this species. *Malus fusca* (Rafinesque) Schneider, an older name, is not certainly applicable.

The fruit was an important food for the Indians, who dried

IV. THE SERVICEBERRIES

GENUS **AMELANCHIER** MEDICUS



ABOUT 30 species of *Amelanchier*, all unarmed trees and shrubs, have been described; they abound in the temperate portions of the northern hemisphere, being most abundant, as to species, in North America, where, in addition to the arborescent kinds, about 17 species of shrubs are reported, one of them occurring in the mountains of Mexico.

The leaves are simple, entire, or variously toothed, stalked and stipulate. The flowers are perfect, disposed in racemes or rarely solitary, appearing with the leaves; the calyx-tube is bell-shaped, adnate to the ovary, its 5 lobes narrow, reflexed and persistent; the 5 petals are strap-shaped; the many stamens are inserted with the white petals; in the throat of the calyx, filaments awl-shaped; the ovary is inferior, its cavities becoming double the number of styles, of which there are 2 to 5; these are united and hairy at the base. The fruit is a small, berry-like pome, with persistent remnants of calyx and stamens at the top, 4-to 10-celled, each cell containing a small, erect cartilaginous coated seed.

The fruits of most of these plants, which are also called June-berries, are edible,

having a pleasant taste and flavor; their small size, however, prevents their more general use. It is to be hoped that horticulturists will eventually succeed in their endeavor to secure improved varieties with larger fruit.

The name applied to these plants is the Savoyan name of the European serviceberry, *Amelanchier Amelanchier* (Linnæus) Sargent, the type of the genus.

The arborescent species in our area are:

Eastern trees; leaves mostly serrate or serrulate nearly to the base.

Top of ovary smooth, or nearly so; leaves mostly acute or acuminate at the apex.

Young leaves and inflorescence smooth or slightly hairy; leaves mostly cordate or rounded at the base.

Young leaves and inflorescence white-woolly; leaves mostly narrowed or rounded at base, rarely subcordate.

Top of ovary woolly; leaves rounded, obtuse or subacute at apex.

Leaves coarsely toothed.

Leaves finely loothed.

Western trees; leaves obtuse, toothed above the middle, seldom nearly to the base.

Mature leaves firm, pale green.

Mature leaves thin, bright green.

1. *A. canadensis*.

2. *A. intermedia*.

2. *A. sanguinea*.

4. *A. alabamensis*.

5. *A. alnifolia*.

6. *A. florida*.

1. SERVICEBERRY — *Amelanchier canadensis* (Linnæus) Medicus

Mespilus canadensis Linnæus. *Amelanchier Botrya pium* de Candolle

This medium-sized tree, also called Juneberry, and Service tree, occurs in dry, hilly woods from Newfoundland to Ontario, and Kansas, southward to Florida, and Louisiana, attaining a maximum height of 18 meters and a trunk diameter of 7.5 dm.

Its branches are slender and spreading, the tree becoming broad and round. The bark is about 6 mm. thick, shallowly fissured lengthwise, and broken into angular reddish brown scales. The twigs are slender, smooth or nearly so, soon becoming reddish, finally dark red-brown; the buds are about 6 mm. long, covered by brown scales. The leaves are thick and firm, ovate or oval, 2.5 to 10 cm. long, or larger on vigorous young shoots, sharp-pointed or taper-pointed, rounded or heart-shaped at the base, rather coarsely toothed, red-brown and slightly hairy when young, becoming smooth on both sides or sometimes persistently somewhat hairy beneath, dull, dark green, with impressed midrib above, paler, with the midrib



FIG. 383. — Serviceberry.

becoming smooth on both sides or sometimes persistently somewhat hairy beneath, dull, dark green, with impressed midrib above, paler, with the midrib

prominent on the under side; the slender grooved leaf-stalks are 1.5 to 2.5 cm. long. The flowers, opening when the leaves are about one fourth expanded, in March or April to May, are in spreading or drooping racemes 7 to 10 cm. long, on slender pedicels 1.5 to 3 cm. long; the bracts are purplish, silky, but fall away before the flowers open. The calyx is bell-shaped, nearly smooth, with lanceolate sharp-pointed lobes, one fourth to one half the length of the petals, which are linear-spatulate or linear-oblong, 1.2 to 1.8 cm. long; the ovary is smooth at the top, or nearly so. The fruit, ripening in June or July, is red-purple, with a bloom when fully ripe, about 6 mm. in diameter, and sweet; seeds about 3 mm. long.

The wood is hard, strong, close-grained, dark reddish brown, and satiny; its specific gravity is about 0.78. It is sometimes used for tool-handles and portions or machinery, as is the wood of many of the trees of the Apple family.

2. SWAMP SERVICEBERRY — *Amelanchier intermedia* Spach

Amelanchier Botryapium Hooker, not de Candolle. *Amelanchier obovalis* Ashe

Amelanchier canadensis obovalis Michaux

Also called Shad bush and Swamp sugar pear, this is a small tree or shrub, inhabiting moist soil, occurring from New Brunswick to Manitoba, southward to Florida and Louisiana, reaching a maximum height of 9 meters, and a trunk diameter of about 6 dm.



FIG. 384. — Swamp Serviceberry.

The trunk is straight when growing singly; often, however, several trunks ascend together from a common base. The bark is about 6 mm. thick, grayish brown, scaly or quite smooth, with few fissures or none. The twigs are slender and hairy, becoming smooth or nearly so, dark reddish brown. The leaves are oval, oblong, elliptic or obovate, 4 to 6 cm. long, or those of young shoots larger, pointed at apex, narrowed, rounded or slightly heart-shaped at the base, margined nearly to the base by sharp teeth, densely white-woolly when young, becoming smooth when old, dull green above, pale beneath. The

flowers, opening before the leaves are fully expanded, in April or May, are in short, often dense, white-woolly racemes 2.5 to 6 cm. long, on short hairy pedicels 1 to 2 cm. long; the calyx-tube and its long lobes are densely white-woolly, the lobes, one third to one half the length of the spatulate petals, which are 6 to 14 mm. long; the ovary is nearly smooth at the top. The fruit is globular, about 8

mm. in diameter, dark purple when ripe, juicy, and sometimes of better flavor than that of the Serviceberry.

3. ROUND-LEAVED SERVICEBERRY—*Amelanchier sanguinea* (Pursh) Lindley

Amelanchier rotundifolia (Michaux) Rœmer. *Pyrus sanguinea* Pursh

This small tree or shrub occurs in woods and thickets from New Brunswick to New York and Minnesota, and southward, along the mountains, to North Carolina. Its maximum height is 6 meters, with a trunk diameter of about 3 dm.

The bark is quite smooth and light-colored. The twigs are slender, red or gray-brown. The leaves are thick and firm, broadly oval, ovate or suborbicular, 4 to 8 cm. long, usually blunt or rounded at each end, sometimes abruptly blunt-pointed, often heart-shaped at the base, margined to the base, or nearly so by large, often incurved teeth, bright green above, smooth on both sides almost from the first, pale or whitish beneath, the midrib prominent and yellowish, the leaf-stalk stout. The flowers appear in May, in short, smooth racemes; the calyx is smooth, its lobes lanceolate; the petals are spatulate or oblanceolate, 1 to 1.6 cm. long; the ovary is woolly at the top. The fruit is globose, 6 to 8 mm. in diameter, the stout pedicels 2 to 4 cm. long.



FIG. 385. — Round-leaved Serviceberry.

4. ALABAMA SERVICEBERRY—*Amelanchier alabamensis* Britton

The type specimens of this species, here described as new, were collected by Professor F. S. Earle and Mr. C. F. Baker (No. 1610) in the spring of 1898, at Auburn, Lee county, Alabama, from a tree 5 meters in height.

The young shoots are loosely hairy, the older ones smooth and gray-brown; the winter buds are oblong, blunt-pointed, 4 or 5 mm. long. The leaves are ovate to elliptic, or some of them obovate, 8 cm. long or less, 2.5 to 5 cm. wide, rather abruptly pointed at the apex, rounded or slightly heart-shaped at the base, densely whitish-woolly on the under surface and somewhat hairy on the upper side when young, sparingly but persistently hairy beneath, and smooth, dark green and shining on the upper surface when old, finely toothed, their hairy stalks half as



FIG. 386. — Alabama Serviceberry.

While nearly always a mere shrub, this species occasionally develops, under favorable conditions, into a small tree with a maximum observed height of about 5 meters. It inhabits hillsides and the banks of lakes and streams from western Ontario to the valley of the Yukon River, Nebraska, New Mexico, and Nevada.

The young twigs are loosely hairy, soon becoming smooth and gray-brown to reddish brown; the winter buds are oblong, 4 or 5 mm. long, their scales smooth or somewhat hairy. The leaves are pale green, usually more or less hairy when young, becoming smooth or nearly so, and firm in texture when mature; they vary from nearly orbicular to elliptic or obovate-elliptic and from 2 to 5 cm. long seldom twice as long as wide, and are rather coarsely and sharply toothed toward the apex, the serrations sometimes extending below the middle; their stalks are hairy or smooth and usually less than half as long as the blades. The flowers are in short, loosely hairy, or nearly smooth racemes, and open in May or June, when the leaves are nearly fully grown in size, though they become much thicker later in the season; the calyx-lobes are lanceolate to ovate-lanceolate, pointed, hairy, becoming smooth; the petals are linear, oblong-linear or oblanceolate, 8 to 16 mm. long. The fruit is dark blue, about 1 cm. in diameter, juicy and edible.

long as the blades or less. The tree flowers in late February or early March; the axis of the racemes, the pedicels, and the ovate pointed calyx-lobes are loosely hairy, becoming smooth when old; the top of the ovary is white-woolly. The fruit is about 9 mm. in diameter.

5. ROCKY MOUNTAIN SERVICE TREE

Amelanchier alnifolia Nuttall

Amelanchier oreophila A. Nelson



FIG. 387. — Rocky Mountain Service Tree.

6. NORTHWESTERN SERVICE TREE — *Amelanchier florida* Lindley*Amelanchier Gormanii* Greene. *Amelanchier Cusickii* Fernald

The Northwestern Juneberry occurs along streams and lakes and on hillsides from Alaska to Washington, Montana, and California, sometimes becoming 7 meters high, with a trunk 2 to 2.5 dm. in diameter; it is usually smaller, however, and often a shrub. It has been confused with *Amelanchier alnifolia* by most authors, but is regarded as distinct from that species by recent students of our northwestern flora.

Its bark is thin, brown, nearly smooth. The young twigs vary from smooth to loosely hairy; the winter buds are about 5 mm. long, either smooth or with somewhat hairy scales. The leaves are thin, rather bright green, either smooth or hairy when young, always nearly or quite smooth when mature; they are mostly elliptic or ovate-oblong, varying to obovate, sometimes twice as long as wide, 3 to 6 cm. long, obtuse at the apex, rounded, slightly cordate, or sometimes narrowed at the base, rather coarsely toothed above the middle, sometimes toothed to about two thirds of the way toward the base; their stalks are smooth or hairy, usually less than half as long as the blades. The racemes of flowers are short and rather dense. The blue-black often glaucous fruit is larger than that of the other species, sometimes 2 cm. in diameter, and is much collected for food.



FIG. 388. — Northwestern Service Tree.

V. TOLLON

GENUS **HETEROMELES** RØMERSpecies **Heteromeles arbutifolia** (Aiton) Rømer*Crataegus arbutifolia* Aiton

ALSO called Toyon, Christmas berry, and California holly, this tree occurs in western California, Lower California, and on the adjacent islands. Upon the latter it attains the greatest development, reaching a height of 9 meters, with a trunk diameter of 4.5 dm.; often, however, it is merely a much-branched shrub.

The trunk is straight but short, and divided into numerous branches, the tree being round-topped; the bark is 1.5 to 2 cm. thick, rather smooth, but with a few shallow fissures, light gray and somewhat aromatic; the twigs are round, pale-hairy at first, but eventually become smooth and red-brown. The leaves, which remain upon the plant for two or three seasons, are alternate, oblong to oblong-lanceolate, 8 to 10 cm. long, sharply stiff-pointed, slightly rounded or wedge-shaped at the base, irregularly sharp-toothed or nearly entire, dark green and shining, with midrib deeply impressed above, paler and prominently net-veined beneath;



FIG. 389. — Tollon.

the petiole is 1 to 2 cm. long; the minute stipules fall away early. The flowers, appearing in summer with the new foliage, are in terminal compound panicles 10 to 15 cm. broad, more or less leafy bracteate and very hairy; the calyx-tube is hairy below, smooth above, the short lobes triangular, spreading and persistent; the 5 petals are broadly wedge-shaped, notched or irregularly toothed at the apex, smooth and white; the stamens are inserted with the petals in pairs opposite the calyx-

lobes, their filaments are awl-shaped, incurved, the anthers oblong to ovate, opening lengthwise; the pistil consists of 2 partly united inferior woolly carpels; the styles are terminal, distinct, enlarged at the apex into broad stigmas; ovules 2 in each cell. The pome is obovoid to oblong, red or rarely yellow, fleshy; the hollow top is filled by white hairs; it is nearly 1 cm. long, mealy, astringent, and ripens in December; there is usually one seed in each cell.

The wood is very hard, close-grained, and reddish brown; its specific gravity is about 0.93. The brilliant, persistent fruit and dark glossy foliage should insure it a place in all ornamental plantations where it will thrive; it is hardy in the southern States and in southern Europe. The branches are largely collected in its native region for Christmas and other decorations.

This genus, which is monotypic, receives its name from the Greek, in allusion to its differences from other genera of the family.

VI. THE THORN TREES *

GENUS **CRATÆGUS** LINNÆUS

PECIES of this genus occur in the north temperate zone, and southward along the highlands of Mexico and South America, but eastern North America is the center of its distribution, and here it ranges from Newfoundland westward throughout the St. Lawrence basin and southward all over the eastern United States, a few species occurring in the Rocky Mountain States and on the Pacific slope. They are most abundant, both as to varieties and individuals, in the limestone formations of the St. Lawrence-Great Lakes region and the Missouri-Arkansas region, few occurring near the Atlantic coast.

Previous to 1899 about 65 species were known, about 25 of which were North American, but since then over 600 species of these trees and shrubs have been described. Many of these proposed new species have been based on such unstable characters as the number of the stamens and the color of their anthers, and considerable careful investigation will be necessary before the validity of many of them is accurately determined. It seems likely that some of these forms are natural hybrids between species. The trees here described seem to be distinct species, and others which have been proposed may prove to be so when further studied.

They are usually spiny, much-branched shrubs or small trees, with dark brown, scaly bark, the winter buds globose or subglobose, bright chestnut-brown. The leaves are deciduous, alternate, simple, toothed, lobed or sometimes deeply cut; the leaves of the young vigorous shoots are generally much larger, and often more deeply lobed than those of the older branches; the stipules are linear, glandular-toothed, deciduous, but on young shoots often large and persistent. Flowers white, rarely some shade of red, borne in simple or compound corymbs, generally with linear, bright-colored, glandular, deciduous bracts; calyx-tube cup-shaped or bell-shaped, adhering to the carpels, its 5 lobes pointed or long-pointed, generally glandular-toothed, rarely leafy, persistent on the fruit or deciduous; petals 5, rounded, inserted in the mouth of the calyx; stamens 5 to 25, often variable in the same species; filaments thread-like, incurved; anthers oblong to suborbicular, white, yellow, pink, or purple; ovary inferior or its summit free, composed of from 1 to 5 carpels; styles 1 to 5, free, commonly surrounded at the base by a tuft of hairs; stigmas terminal, persistent; fruit subglobose, ovoid, oblong or pear-shaped; red, green, yellow, purple, blue or black; flesh thin or thick, hard and dry in some groups, soft, succulent or mealy and edible in others, containing 1 to 5 one-seeded nutlets (in *C. Oxyacantha* 2-seeded); seeds erect, flattened.

When the trees become better known they will be largely used in ornamental planting, for screens, borders, and hedges, on account of their beautiful flowers, which, by a proper selection of varieties, can be had from about May 15 to June 15,

* Contributed by Mr. W. W. Eggleston.

in the North. The fruit is also very ornamental and lasts from August until winter; it is also a favorite food of our native birds, and honey-bees visit the flowers in myriads. As a hedge plant the Hawthorn has been used in the Old World for centuries, but many of our native species are equally if not more desirable as such, and stand any amount of pruning. For individual lawn plants, they are also very desirable, as is shown by the cultivated forms, a form of the Hawthorn with magnificent double red flowers being an especially striking example. The fruits of several Old World forms are used as food, and a beverage was formerly made from them; in this country the fruits of *C. æstivalis* and of other southern species are made into preserves and jellies; the fruit of *C. mollis* is sold in the markets of Montreal, Canada, and no doubt others are used locally for the same purposes; there are large-fruited kinds of economic value in Mexico. The genus will bear more careful investigation by the pomologist.

The name is from the Greek, in reference to their hard, compact wood, which is used for tool-handles and mallets. The European Hawthorn, *Crataegus Oxyacantha* Linnæus, is the generic type.

1. Introduced species. Nutlets 2-seeded. Leaves deeply cut; fruit red, oblong to globose; corymbs many-flowered. 1. *C. Oxyacantha*.
2. Native species. Nutlets 1 to 5, 1-seeded. Leaves entire, cut or lobed.
- A. Nutlets without cavities on their inner faces.
 - * Fruit red, yellow or green; nest of nutlets with or without sinuses.
 - † Nest of nutlets with sinuses.
 - ‡ Fruit ripening in autumn.
 - a Leaves entire, or several lobed.
 - b Fruit firm when ripe.
 - c Leaves broadest toward the apex.
 - d Leaves obovate to oblong; leaf-stalks glandless; corymbs many-flowered; fruit ripening late; flesh hard, greenish.
 - e Nutlets usually 1 to 3 (3 to 5 in *Canbyi*); leaves leathery, dark green and shining above; fruit red; flesh thin.
 - Corymbs and leaves smooth; nutlets 1 to 5.
 - Leaves narrow (wider in var. *prunifolia*); nutlets 1 or 2; nest of nutlets longer than thick. 2. *C. Crus-galli*.
 - Leaves wide.
 - Nutlets 2 or 3; nest of nutlets of about equal length and thickness. 3. *C. Palmeri*.
 - Nutlets 3 to 5; nest of nutlets longer than thick. 4. *C. Canbyi*.
 - Corymbs and leaves hairy; nutlets 2 or 3; nest of nutlets of about equal length and thickness.
 - Leaves broad, fruit smooth. 5. *C. fecunda*.
 - Leaves narrow, fruit hairy. 6. *C. berberifolia*.
 - ee Nutlets usually 3 to 5; leaves thin, impressed

- veined and dull above; fruit red or yellow; flesh thick.
- Nutlets 3 or 4; leaves narrow.
- Nutlets usually 3; nest of nutlets longer than thick; leaves smooth, bright dark yellow-green above. 7. *C. pausiaca*.
- Nutlets 3 or 4; nest of nutlets of about equal length and thickness; leaves hairy, dull gray-green above. 8. *C. punctata*.
- Nutlets 5; nest of nutlets shorter than thick; leaves wide. 9. *C. suborbiculata*.
- dd Leaves short-obovate to spatulate; leaf-stalks, leaves and corymbs conspicuously glandular; corymbs few-flowered; nutlets usually 3 or 4; fruit green, orange or red, subglobose or oblong, hard; leaves thin; twigs conspicuously zigzag.
- Corymbs smooth; nest of nutlets shorter than thick. 10. *C. lacrimata*.
- Corymbs hairy.
- Fruit smooth.
- Fruit yellow-green; nest of nutlets shorter than thick; leaves obovate. 11. *C. flava*.
- Fruit red; nest of nutlets of about equal length and thickness; leaves spatulate. 12. *C. recurva*.
- Fruit, twigs, and leaves hairy; nest of nutlets of about equal length and thickness. 13. *C. dispar*.
- cc Leaves broadest at the middle.
- Fruit smooth; nutlets 3 to 5; fruit red, subglobose to oblong; flesh thin; corymbs smooth, many-flowered; leaves 3-lobed, smooth, bright dark green above.
- Fruit bright red, 5 to 7 mm. thick. 14. *C. viridis*.
- Fruit dull brick red, 6 to 9 mm. thick. 15. *C. nitida*.
- Fruit hairy.
- Nutlets 3 to 5; nest of nutlets shorter than thick; corymbs hairy, many-flowered; leaves thick, hairy above when mature, orbicular-ovate; flesh thick; fruit globose, orange-red. 16. *C. Harbisoni*.
- Nutlets 5, the nest of about equal length and thickness; leaves thin, smooth above when mature, oblong to oval; fruit oblong to globose, orange-red; flesh thin; corymbs many-flowered. 17. *C. Berlandieri*.
- ccc Leaves broadest toward the base.
- Nutlets usually 3 or 4; sinus between nutlets shallow; nest of nutlets shorter than thick; fruit greenish or reddish yellow, nearly globular, angular; flesh thick, hard; corymbs few-flowered; leaves half-leathery, yellow-green. 18. *C. Boyntoni*.
- Nutlets usually 3 to 5; sinus between nutlets deep; nest of nutlets shorter than thick; fruit depressed globose to short oblong, angled, waxy; flesh

thick and hard; corymbs smooth, many-flowered; leaves thin but firm, smooth with age. Fruit green tinged with scarlet, prominently angled, young fruit conspicuously waxy.

Fruit cherry-red; terminal leaves heart-shaped at the base.

19. *C. pruinosa*.

20. *C. silvicola*.

bb Fruit soft when ripe.

Leaves broadest toward the apex; nutlets 4 or 5; nest of nutlets shorter than thick; fruit hairy; leaves obovate.

Fruit red.

Nutlets ear-shaped; fruit becoming smooth; leaves thin, dull above; calyx-lobes spreading; corymbs many-flowered.

21. *C. pyriformis*.

Nutlets rounded at both ends; leaves thick, shining above; calyx-lobes erect; corymbs few-flowered.

22. *C. Ashei*.

Fruit lemon-yellow; nutlets 5; leaves thin, bright dark green above.

23. *C. brazoria*.

Leaves broadest at the middle.

Nutlets usually 2 to 4; fruit red, nearly globular; corymbs many-flowered; leaves thin but firm.

Nutlets 2, nearly smooth on the back.

24. *C. Margaretta*.

Nutlets 2 to 4, strongly ridged on the back.

Nest of nutlets shorter than thick; fruit about 10 mm. thick, dark red; leaves 3 to 5 cm. wide.

25. *C. rotundifolia*.

Nest of nutlets longer than thick; fruit about 15 mm. thick, carmine-red; leaves 4 to 7 cm. wide.

26. *C. Jonesæ*.

Nutlets 5; nest of nutlets shorter than thick.

27. *C. collina*.

Leaves broadest toward the base.

Fruit smooth.

Nutlets usually 3 or 4, with acute ends; fruit oblong or pear-shaped; flesh thick, succulent, edible; corymbs many-flowered; leaves thin, smooth with age.

Fruit pear-shaped; nutlets usually 4; nest of nutlets longer than thick; leaves oblong-ovate, thin.

28. *C. tenuifolia*.

Fruit oblong or ovoid; nutlets 3 or 4; nest of nutlets of about equal length and thickness; leaves wedge-ovate.

29. *C. pentandra*.

Nutlets usually 5, with rounded ends; nest of nutlets shorter than thick; fruit large, smooth, scarlet, subglobose to short-oblong, five-angled, calyx prominent; flesh thick and soft, edible; leaves thin, smooth, often broader than long, prominently lobed; corymbs smooth, generally many-flowered.

30. *C. coccinioides*.

Fruit hairy; nest of nutlets shorter than thick.

Leaves slightly lobed; nutlets usually 3 to 5; fruit large, scarlet, hairy, oblong; flesh thick, edible; corymbs many-flowered; leaves thin,

becoming smooth above, broad; young foliage red-bronze.

Nutlets usually 4 or 5; leaves hairy.

31. *C. Pringlei*.

Nutlets 5; leaves and corymbs woolly-hairy.

32. *C. texana*.

Leaves often deeply lobed.

Flesh thin; nutlets 5; leaves thin; leaves scabrate above when mature, elliptic-ovate; fruit depressed globose, red.

33. *C. gravigida*.

Flesh thick; nutlets usually 5; fruit large, hairy, subglobose, oblong or pear-shaped, red, edible; corymbs hairy, many-flowered; leaves thin, yellow-green, broad, prominently lobed; young foliage yellow-green.

Leaves and young twigs hairy.

Fruit red or crimson, sometimes 25 mm. thick; nutlets 7 to 9 mm. long, 10 mm. thick; leaves 4 to 10 cm. wide, 4 to 13 cm. long.

34. *C. mollis*.

Fruit scarlet, sometimes 15 mm. thick; nutlets 6 to 8 mm. long, 7 to 9 mm. thick; leaves 3 to 8 cm. wide, 3 to 8 cm. long.

35. *C. canadensis*.

Leaves and young twigs densely woolly-hairy; fruit bright cherry-red; nutlets 6 to 8 mm. long, 8 to 11 mm. thick.

36. *C. lanuginosa*.

aa Leaves conspicuously 3- to 5-lobed; fruit small; depressed-globose, red; nutlets 5, with conspicuous calyx-scar; flesh thin; leaves half-leathery, bright green above; corymbs smooth, many-flowered.

37. *C. Phænopyrum*

‡‡ Fruit ripening in spring; sinuses between nutlets deep; nest of nutlets shorter than thick; nutlets 5; fruit subglobose, red; flesh thick, soft, edible; corymbs woolly-hairy, few-flowered; leaves rusty woolly-hairy.

38. *C. æstivalis*.

†† Nest of nutlets without sinuses; nutlets 2 to 5, calyx-scar conspicuous; fruit small, oblong, scarlet; corymbs many-flowered; leaves hairy, veins extending both to the points of the lobes and the bottoms of the sinuses.

Nutlets 2; leaves deeply cut.

39. *C. Marshallii*.

Nutlets 5; leaves entire.

40. *C. spathulata*.

** Fruit blue-black; nest of nutlets without sinuses; nutlets 3 to 5, calyx-scar conspicuous; nest of nutlets shorter than thick; fruit subglobose; flesh thin; corymbs smooth, many-flowered; leaves smooth, half-leathery, dark green and shining above, narrowed at the base, veins extending both to the points of the lobes and the bottoms of the sinuses.

41. *C. brachyacantha*.

B. Nutlets with a shallow cavity on each inner face, or cavities on individual nutlets sometimes faint or wanting; fruit red.

Nutlets usually 3 to 5; leaves thin but firm, bright yellow-green above.

Nutlets 3 or 4; leaves and corymbs nearly smooth.

42. *C. columbiana*.

Nutlets 5; leaves, corymbs and fruits densely hairy.

43. *C. laurentiana*.

Nutlets usually 2 to 4; leaves half-leathery, bright green and shining above.

Nutlets usually 2 or 3.

Fruits, corymbs, and leaves hairy.

Fruits, corymbs, and leaves smooth.

Nutlets usually 3 or 4.

C. Nutlets with distinct cavities on their inner faces.

Nutlets usually 2 or 3, with 1 deep cavity on each inner face; fruit red; leaves hairy beneath, at least along the veins, often hairy above; spines 3 to 10 cm. long; corymbs hairy, many-flowered.

Fruit subglobose to short-oblong, dark red; flesh succulent; leaves leathery, dark green and shining above.

Fruit pear-shaped to oblong, crimson; leaves thin, dull green, hairy, and with impressed veins above.

Nutlets with several shallow cavities on each inner face; fruit black, short-oblong to subglobose; nutlets 3 to 5, ear-shaped, with a conspicuous calyx-scar; leaves smooth beneath, half-leathery; spines 1 to 3 cm. long.

Leaves broad; corymbs hairy.

Leaves narrow; corymbs smooth.

Leaves lanceolate-elliptic; nutlets usually 4.

Leaves small rhombic-elliptic; nutlets 5.

44. *C. pertomentosa*.

45. *C. asperifolia*.

46. *C. Brainerdi*.

47. *C. macracantha*.

48. *C. Chapmani*.

49. *C. Douglassi*.

50. *C. rivularis*.

51. *C. saligna*.

I. HAWTHORN — *Crataegus Oxyacantha* Linnæus

This common species of the Old World has sparingly escaped from cultivation along roadsides and in thickets in the east. It is a shrub or a small tree, sometimes 6 meters high, with ascending or nearly erect branches forming an oblong crown; the bark is dark brown and scaly; the twigs are reddish brown, smooth, often end in spines, and are armed with sharp chestnut-brown spines 1 cm. long or more.



FIG. 390. — Hawthorn.

The leaves are ovate, 3-lobed to 7-lobed or cleft, toothed or doubly toothed, with small, flattened teeth, 1 to 4 cm. long, 1 to 4.5 cm. wide, slightly hairy or nearly smooth when young, becoming smooth, except on the lower side of the veins when mature, dark green on the upper surface, paler beneath, pointed at the apex, wedge-shaped, often abruptly so at the base; leaf-stalks 5 to 20 mm.

long. The flowers are white or pink, about 15 mm. wide, numerous in smooth corymbs; the calyx-lobes are triangular, rounded or pointed; stamens about 20; anthers pink; styles 2 or 3. The fruit ripens in October, is globose or subglobose,

about 6 mm. thick, red, the persistent calyx-lobes reflexed; its flesh is yellow, mealy, insipid; nutlet 1, slightly pointed at the apex, ridged lengthwise. Also called English hawthorn, Whitethorn, May hawthorn and May.

2. COCK-SPUR THORN — *Cratægus Crus-galli* Linnaeus

This species occurs from the vicinity of Montreal, Canada, southward along Lake Champlain to Connecticut, Virginia, and through the Appalachian foothills to northern Georgia and Alabama and westward through southern Ontario and southern Michigan to Missouri. It is a tree sometimes 8 meters high, with stout and spreading branches; the bark is grayish brown, scaly; the twigs are smooth, light brown to gray, and usually bear straight or slightly curved, chestnut-brown spines from 3 to 8 cm. long.

The leaves are obovate to elliptic, 2 to 12 cm. long, 1 to 3 cm. wide, pointed or rounded at the apex, wedge-shaped and entire at the base, sharply toothed toward the apex, smooth, thin, but becoming leathery, dark green and shining above, paler beneath; leaf-stalks wing-margined towards the apex, 5 to 20 mm. long. The flowers are about 15 mm. wide, numerous in smooth corymbs; the calyx-lobes are linear, long-pointed, smooth or slightly short-hairy; stamens about 10; anthers pink; styles 1 to 3. The fruit ripens late; it is short-oblong to subglobose, about 15 mm. long, dull red, the calyx-lobes reflexed; flesh greenish, firm, dry, containing 1 to 3 (usually 2) nutlets, 8 to 9 mm. long, strongly ridged on the back, the nest of nutlets 7 to 9 mm. thick.

This species is very variable. *C. prunifolia* Poiret is a broad-leaved variety, occurs from southern Ontario to southern Michigan and south to Pennsylvania; variety *pyracanthifolia* Aiton has narrower leaves, slightly pubescent when young, and smaller bright red fruit, and grows from northern Delaware to Ohio; variety *oblongata* Sargent, having brighter colored oblong fruit, often 2.5 cm. long and with acute nutlets, is found near Wilmington, Delaware, and in Bucks county, Pennsylvania; variety *capillata* Sargent, with thinner leaves, slightly hairy corymbs, and commonly 1 nutlet, is found near Wilmington, Delaware.



FIG. 391. — Cock-Spur Thorn.

3. PALMER'S THORN — *Cratægus Palmeri* Sargent

Palmer's thorn occurs in southwestern Missouri.

It is a tree sometimes 7 meters high with stout, spreading branches, forming a broad round-topped crown; the twigs are smooth and are armed with straight brown spines from 2 to 7 cm. long. The leaves are ovate-orbicular, from 2 to 6 cm. long and from 2 to 5 cm. wide, pointed at the apex, wedge-shaped at the base, coarsely toothed, leathery, dark green and shining above, light green beneath, smooth; leaf-stalks about 1 cm. long, slightly wing-margined. The flowers are about 1 cm. broad in many-flowered, smooth corymbs; calyx-lobes triangular, long-pointed, remotely toothed, smooth; stamens



FIG. 392. — Palmer's Thorn.

about 10; anthers pale yellow; styles 2 or 3. The fruit, ripening late, is subglobose, dull green tinged with red, about 1 cm. thick; flesh yellow, dry, and mealy; it contains 2 or 3 nutlets about 5 mm. long, the nest about 5 mm. thick; nutlets strongly ridged on the back.

4. CANBY'S THORN — *Cratægus Canbyi* Sargent

Canby's thorn occurs from eastern Pennsylvania to the shores of Chesapeake Bay, Maryland. It is a bushy tree, sometimes 6 meters high, with long, ascending branches, forming a broad, irregular head; the young twigs are brown, becoming light gray, and are armed with chestnut-brown spines from 2 to 4 cm. long.

The leaves are oblong-ovate, from 2.5 to 8 cm. long and from 2 to 6 cm. wide, pointed at apex, wedge-shaped at base, doubly toothed, sometimes lobed, leathery, smooth, dark green and shining above, paler and with conspicuous veins beneath; leaf-stalks



FIG. 393. — Canby's Thorn.

about 10; anthers pale yellow; styles 2 or 3. The fruit, ripening late, is subglobose, dull green tinged with red, about 1 cm. thick; flesh yellow, dry, and mealy; it contains 2 or 3 nutlets about 5 mm. long, the nest about 5 mm. thick; nutlets strongly ridged on the back.

slightly winged, glandular, 1.5 to 2.5 cm. long. The flowers are about 15 mm. wide, in many-flowered, smooth corymbs; the calyx-lobes are long-pointed, remotely glandular-toothed; stamens about 10; anthers pink; styles 3 to 5. The fruit ripens late; it is short-oblong to globose, 10 to 15 mm. long, dark crimson, calyx-lobes reflexed; flesh thick, bright red, juicy; it contains 3 to 5 nutlets from 7 to 8 mm. long, the nest of nutlets from 6 to 7 mm. thick; they are rounded at the ends and strongly ridged on the back, with a sinus between them.

5. FRUITFUL THORN — *Cratægus fecunda* Sargent

This species occurs in rich woods and bottom lands, from southeastern Missouri to southwestern Indiana. It is a tree from 6 to 8 m. high, with stout, wide-spreading branches, forming a broad round-topped crown; the twigs are slightly hairy, soon becoming smooth, light orange-green turning ashy-gray, and bear many slender nearly straight chestnut-brown shining spines from 5 to 7 cm. long.

The leaves are oblong-ovate to broadly ovate, from 3 to 9 cm. long and from 2 to 7 cm. wide, dark green and shining above, pale yellow-green beneath, firm in texture, with strongly marked veins, the apex pointed or long-pointed, the base wedge-shaped, sometimes abruptly so, doubly toothed nearly to the base, slightly hairy when young, becoming glabrous except on the veins beneath; leaf-stalks slightly winged, 1 to 2 cm. long, hairy. The flowers are about 2 cm. wide in many-flowered, slightly long-hairy corymbs; calyx-tube long-hairy, its lobes lanceolate, pointed, coarsely toothed, with stalked dark red glands; stamens about 10; anthers small, dark purple; styles 2 to 4. The fruit ripens late; it is short-oblong to subglobose, from 20 to 25 mm. long, orange-red, with a few hairs; calyx-lobes erect; flesh thick and hard, pale green, dry and sweet; it contains 2 to 4 nutlets from 8 to 10 mm. long, the nest from 8 to 10 mm. thick; they are rounded at the ends and strongly ridged on the back.



FIG. 394. — Fruitful Thorn.

6. BARBERRY-LEAVED HAW — *Cratægus berberifolia* Torrey and Gray

This thorn occurs from North Carolina to Texas. It is a tree sometimes 12 meters high, with stout spreading branches, forming a broad flat-topped crown;

the bark is dark gray, scaly; the young twigs are covered with matted white hairs but become smooth with age and are armed occasionally with slender red-brown spines.



FIG. 395. — Barberry-leaved Haw.

The leaves are oblanceolate-ovate, 2 to 6 cm. long, 1 to 4 cm. wide, pointed or short-pointed at the apex, strongly wedge-shaped at the base, finely toothed, rough hairy and shining above, pale and hairy below, particularly along the slender midrib and veins, dark green, half leathery; leaf-stalks densely woolly-hairy, becoming smoother, winged above, about 1 cm. long. The flowers are about 15 mm. wide in

long-hairy, few-flowered corymbs; calyx-tube long-hairy, the lanceolate long-pointed lobes slightly hairy, remotely toothed; stamens about 20; anthers yellow; styles 2 to 3. The fruit ripens late in October; it is subglobose, about 10 mm. thick, orange and red, slightly hairy, calyx-lobes spreading; flesh thin, yellow; it contains 2 to 3 nutlets strongly ridged on the back, the nest of nutlets about 6 mm. long and 6 mm. thick.

7. PHILADELPHIA THORN — *Crataegus pausiaca* Ashe

Eastern Pennsylvania is the home of this species. It is a tree from 6 to 8 meters high, with spreading branches forming a flat or round crown; the bark is dark brown, scaly; the young twigs are orange-green, becoming gray, and bear numerous stout, curved, light brown spines from 4 to 6 cm. long; the trunk sometimes has branched spines 3 dm. long.

The leaves are oblanceolate-ovate, 3 to 6 cm. long, 1.5 to 4 cm. wide, sharp-pointed to rounded at the apex, wedge-shaped at the base, doubly toothed above, dark yellow-green with impressed veins on the upper surface, paler beneath, slightly hairy when young, becoming smooth except on the veins beneath, thin; leaf-stalks wing-margined, 1 to 2 cm. long. The flowers are

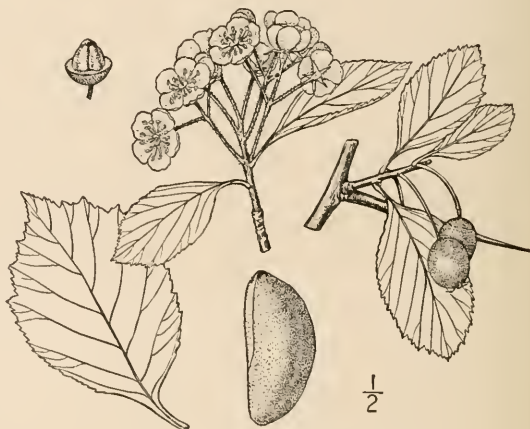


FIG. 396. — Philadelphia Thorn.

about 12 mm. wide, in many-flowered hairy corymbs; calyx-tube smooth near the lobes; lobes smooth outside, hairy within, linear, long-pointed; stamens 10 to 20; anthers dark rose; styles 2 to 4. The fruit ripens early in October; it is oblong-pear-shaped, dull brick-red, about 15 mm. long and about 8 mm. thick, calyx-lobes spreading; the flesh is hard, greenish yellow; it contains 2 to 4 nutlets, commonly 3 or 4, from 7 to 10 mm. long, the nest of nutlets 6 to 9 mm. thick; the nutlets are strongly ridged on the back.

8. LARGE-FRUITED THORN — *Cratægus punctata* Jacquin

This species occurs from the Falls of Montmorency, Quebec, southward, through western New England and along the Appalachian Mountains to northern Georgia and westward to southeastern Minnesota, Iowa, and northern Illinois. It ascends to 500 meters in Vermont and about 1800 meters in North Carolina and Tennessee. It is a tree often 9 meters high, with branches usually horizontal,



FIG. 397. — Large-fruited Thorn, Van Cortlandt Park, N. Y. City.

forming in the older trees a conspicuously flat-topped head; the bark is grayish brown, scaly; the twigs are orange-brown, hairy, becoming gray and smooth, and are armed with straight orange-brown to light gray spines from 2 to 5 cm. long.

The leaves are obovate, pointed or rounded at the apex, doubly toothed above, from 2 to 8 cm. long, 1 to 5 cm. broad, hairy beneath, especially along the veins,

slightly hairy above when young, becoming smooth, thick, dull gray-green; midrib and veins strongly sunken in the upper surface; leaf-stalks slightly winged, 1 to 2 cm. long. The flowers are about 15 mm. wide in many-flowered, woolly-hairy corymbs; calyx-tube short-hairy, the lanceolate pointed lobes less so; stamens about 20; anthers white to pink; styles 3 to 5. The fruit ripens late; it is short-oblong to subglobose, 12 to 25 mm. thick, dull red, yellowish green to bright yellow, dotted; calyx-lobes spreading; flesh firm, dry; it contains 3 to 5, usually 3 or 4 nutlets, 8 to 9 mm. long, 8 to 10 mm. thick, with ridged backs and pointed ends.

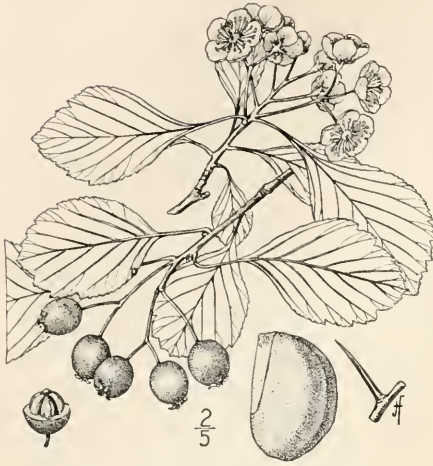


FIG. 398. — Large-fruited Thorn.

This species is also very variable. The variety *aurea* Aiton, has yellow fruit,

lighter anthers, and slightly smaller nutlets than the type. Variety *canescens* Britton is a form with whitish woolly-hairy leaves and corymbs.

9. CAUGHNAWAGA THORN — *Crataegus suborbiculata* Sargent

This thorn occurs about the limestone ridges of the Caughnawaga Indian reservation and on the island of Montreal, Quebec. It is a tree from 5 to 6 meters high, with spreading branches, forming a broad flat-topped crown; the twigs are smooth and are armed with straight or curved chestnut-brown spines, from 3 to 5 cm. long.

The leaves are ovate-orbicular, from 2 to 7 cm. long, and from 2 to 6 cm. wide, the apex pointed, the base broadly wedge-shaped, doubly toothed or often lobed above the middle, thin, smooth with impressed veins and dull dark green above, paler beneath; leaf-stalks winged above, glandular, 1 to 2 cm. long. The flowers are about 2 cm. broad in several-flowered smooth corymbs, calyx-lobes linear, long-pointed, with remote glandular teeth; stamens about 20; anthers rose; styles 4 or 5. The fruit ripens very late, is subglobose, about 2 cm. thick, dull green becoming tinged with red; flesh yellow, dry and hard; calyx-lobes spreading; it contains 4 or 5 nutlets from 6 to 7.5 mm. long, the nest from 8 to 10 mm. thick, the nutlets slightly ridged on the back.

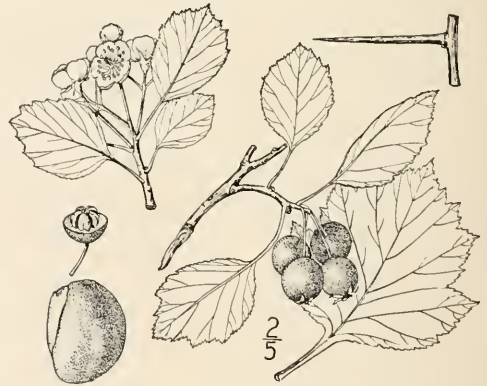


FIG. 399. — Caughnawaga Thorn.

10. SMALL'S HAW — *Cratægus lacrimata* Small

Small's haw grows in sandy woods and along borders of streams of western Florida. It is a large shrub or a small tree, 3 to 5 meters high, with drooping branches forming a handsome round-topped crown; the bark is ash-gray, deeply furrowed; the twigs are orange-brown becoming gray-brown, smooth, and are armed with numerous small straight chestnut-brown spines from 1 to 2.5 cm. long.

The leaves are wedge-spatulate, 10 to 20 mm. long, 5 to 15 mm. wide, rounded, square cut, or pointed at the apex, strongly wedge-shaped at the base, glandular-toothed above the middle with small curved teeth, 3-nerved, smooth, yellow-green, half-leathery; leaf-stalks slightly hairy, wing-margined above, 5 to 15 mm. long. The flowers are about 2 cm. broad in 1- to 5-flowered smooth corymbs; calyx-lobes lanceolate, long-pointed; stamens about 20; anthers bright yellow; styles 3 to 5. The fruit ripens late in August; it is globose or short-oblong, dull brownish yellow, about 8 mm. thick, calyx-lobes spreading; flesh thin, yellow, dry; it contains 3 to 5 nutlets, commonly 3 or 4, 5 to 6 mm. long, slightly ridged on the back, the nest 6 to 7 mm. thick.



FIG. 400. — Small's Haw.

11. SUMMER HAW — *Cratægus flava* Aiton

This species occurs in sandy thickets from Virginia to Florida and Texas. It is a tree sometimes 8 meters high, with spreading or ascending branches, forming a broad irregular top; the bark is dark brown, scaly; the twigs are red-brown and armed with chestnut-brown spines 1 to 6 cm. long.

The leaves are oval, ovate or obovate, 2 to 5.5 cm. long, 1.5 to 4 cm. broad, pointed at the apex, wedge-shaped at the base, crenate-toothed or lobed toward the apex, with gland-tipped teeth, thin, smooth at maturity, yellow-green; leaf-stalks winged toward the apex, glandular, 5 to 15 mm. long. The flowers are about 15 mm. wide in few-flowered hairy corymbs; the calyx-tube is nearly smooth,



FIG. 401. — Summer Haw.

the lobes slightly hairy on the inner surface, lanceolate, long-pointed, glandular-toothed; stamens 10 to 20; anthers pink; styles 3 to 5. The fruit is pear-shaped or oblong, about 10 mm. thick, yellow or yellow-green, sometimes tinged with red; the calyx-lobes are reflexed; the flesh is firm; it contains 3 to 5 nutlets, commonly 4, about 7 mm. long, strongly ridged on the back, the nest about 8 mm. thick.

12. WEEPING THORN — *Cratægus recurva* Beadle

This species grows in dry, sandy soil about Ocala, Florida. It is a shrub, or a low tree, 3 to 5 meters high, with drooping branches forming a broad crown; the bark is grayish brown, rough; the twigs are woolly-hairy when young, reddish brown, and are armed with many slender straight spines 6 to 15 mm. long.

The leaves are spatulate to obovate-wedge-shaped, 10 to 30 mm. long, 5 to 20 mm. wide, slightly hairy, particularly on the lower surface when young, becoming smooth, half-leathery, rounded or broadly pointed, often 3-lobed at the apex, wedge-shaped at the base, often abruptly so, glandular-dentate; leaf-



FIG. 402. — Weeping Thorn.

stalks conspicuously glandular, long-hairy, becoming smooth, 5 to 15 mm. long. The flowers are about 15 mm. wide, solitary, or in 2- or 3-flowered woolly-hairy corymbs; calyx-lobes lanceolate, long-pointed, nearly smooth, remotely glandular-toothed; stamens about 20; anthers pale yellow; styles 3 to 5. The fruit ripens in August; it is pear-shaped, 7 to 9 mm. thick, red, calyx-lobes recurved; flesh thick and soft; nutlets 3 to 5, 6 to 7 mm. long, ridged on the back, the nest 6 to 7 mm. thick.

13. CUTHBERT'S THORN

Cratægus dispar Beadle

Cuthbert's thorn occurs in sandy soil about Aiken and Trenton, South Carolina, and Augusta, Georgia. It is frequently a shrub, sometimes a small tree 6 to 8 meters high, with drooping



FIG. 403. — Cuthbert's Thorn.

branches forming a broad, irregular head; the bark is dark gray or nearly black, furrowed; the twigs are dark red-brown, whitish woolly-hairy at first, becoming smooth, and bear straight red-brown spines 3 to 5 cm. long.

The leaves are obovate to orbicular, 1.5 to 4 cm. long, 1 to 4 cm. wide, pointed or rounded at the apex, wedge-shaped at the base, doubly and irregularly toothed, with from 1 to 3 pairs of lobes, the teeth gland-tipped, densely woolly-hairy when young, becoming smoother above, blue-green; leaf-stalks quite woolly, becoming hairy, glandular, slightly wing-margined above, about 1 cm. long. Flowers about 15 mm. wide in densely white-woolly-hairy 3- to 7-flowered corymbs; calyx-tube densely white-woolly, the lanceolate lobes long-pointed, glandular-toothed, nearly smooth below; stamens about 20; styles 3 to 5. The fruit ripens in August; it is subglobose to oval, red, hairy at the ends; calyx-lobes reflexed, woolly-hairy; flesh thin, yellow, subacid; it contains 3 to 5 nutlets about 6 mm. long, with broad ridges on the backs, the nest of nutlets about 6 mm. thick.

14. SOUTHERN THORN — *Cratægus viridis* Linnæus

This thorn grows in low moist ground from Maryland to Florida and westward to Missouri and Texas. It is a tree from 6 to 11 meters high, with spreading branches forming a round crown, and gray or pale orange-colored bark; the twigs are reddish brown becoming gray, smooth, and occasionally provided with slender spines from 2 to 3 cm. long.

The leaves are oblong-ovate, 2.5 to 8 cm. long, 1 cm. to 4 cm. wide, acute at the apex, sometimes either long-pointed or broad-pointed, wedge-shaped at the base, toothed or doubly toothed, sometimes with one or two pairs of prominent lobes, slightly hairy when young, becoming quite smooth, except on the veins beneath, thin to half-leathery, dark green and shining above, paler beneath; leaf-stalks from 1 to 2 cm. long. The flowers are about 2 cm. wide in many-flowered, smooth corymbs, the calyx-lobes lanceolate, pointed, slightly hairy on the upper surface; stamens about 20; anthers yellow; styles 4 or 5. The fruit ripens late; it is globose or depressed-globose, bright red or orange-red, 5 to 7 mm. thick, flesh thin and dry; nutlets 3.5 to 5 mm. long, ridged on the back, the nest from 5 to 6 mm. thick.



FIG. 404. — Southern Thorn.

15. SHINING THORN — *Cratægus nitida* (Engelmann) Sargent*Cratægus viridis nitida* Engelmann. *Cratægus denaria* Beadle

This species occurs in bottom lands from southern Illinois (east St. Louis and Wabash county), south to eastern Mississippi. It is a tree sometimes 9 meters high, the lower branches spreading and the upper ones erect, making a rounded crown; the bark is dark, scaly, the twigs orange-brown to reddish brown, becoming gray, smooth, and are occasionally armed with brown spines from 3 to 5 cm. long.



FIG. 405. — Shining Thorn.

The leaves are oblong-ovate to oval, from 3 to 8 cm. long, 2 to 6 cm. wide, sharply pointed at both ends, or sometimes bluntish, coarsely doubly toothed, often lobed, half-leathery, green and shining above, paler beneath, smooth except for a few hairs at the junction of the veins on the under side of the young leaves; the leaf-stalks are winged above, glandular, long-hairy towards the blade when young, 1 to 2 cm. long. The flowers are about 2 cm. broad in many-flowered, smooth corymbs; calyx-lobes linear-lanceolate, remotely glandular-toothed; stamens 10 to 20; anthers yellow; styles 3 to 5. The fruit ripens late; it is from 6 to 9 mm. thick, dull yellowish red to brick-red, glaucous, with erect calyx-lobes; the flesh is yellow, firm, mealy; it contains 3 to 5 nutlets 4.5 to 7 mm. long, ridged on the back, the nest 5 to 7 mm. thick.

16. HARBISON'S THORN

Cratægus Harbisoni Beadle

Harbison's thorn occurs commonly on the limestone hills about Nashville, Tennessee. It is a tree sometimes 8 meters high, with spreading branches forming an open symmetrical crown; the bark is gray-brown; the twigs are reddish brown, hairy, becoming smooth and are armed with dark reddish brown spines 3 to 5 cm. long.

The leaves are elliptic-obovate to orbicular, 3 to 10 cm. long, 2 to 9 cm. wide,



FIG. 406. — Harbison's Thorn.

pointed at the apex, wedge-shaped, often abruptly so, at the base, coarsely and doubly toothed, thick, hairy on the upper surface, becoming rough, dark green and shining, and with impressed veins above, paler beneath; leaf-stalks winged above, glandular-hairy, from 10 to 15 mm. long. The flowers are about 2 cm. broad, in many-flowered hairy corymbs; calyx-tube densely hairy at the base, slightly hairy above; calyx-lobes lanceolate, pointed, green, slightly hairy, glandular-toothed; stamens 10 to 20; anthers yellow; styles 3 to 5. The fruit ripens early in October; it is nearly globular, 10 to 13 mm. thick, bright red or orange-red, calyx-lobes spreading; flesh yellow, thick, dry and mealy, containing 3 to 5 nutlets ridged on the back, from 6.5 to 7.5 mm. long, the nest of nutlets 7 to 9 mm. thick.

17. BERLANDIER'S THORN — *Cratægus Berlandieri* Sargent

Berlandier's thorn occurs in the bottom-lands of the Brazos River at Columbia and Brazoria, Texas. It is a tree 5 to 6 meters high, with spreading branches, forming a broad top; the bark is dark brown and furrowed; the twigs are dull reddish brown, whitish matted-hairy at first, becoming smooth, and bear an occasional straight gray spine 2.5 to 3.5 cm. long.

The leaves are oblong-obovate to oval, 4 to 10 cm. long, 3 to 8 cm. wide, pointed at the apex, strongly wedge-shaped at the base, sharply and irregularly doubly toothed nearly to the base, with 3 or 4 pairs of broad, short lobes, hairy on the upper surface, whitish woolly-hairy on the lower side, becoming smooth and dark green

above, paler beneath, thin; leaf-stalks woolly-hairy, becoming smooth, winged above, 1 to 2.5 cm. long. The flowers are about 15 mm. broad in many-flowered whitish woolly-hairy corymbs; calyx woolly-hairy, its lanceolate long-pointed lobes smoother on the upper surface, strongly glandular toothed; stamens about 20; anthers yellow; styles 5. The fruit ripens about the middle of October; it is short-oblong to subglobose, scarlet, about 15 mm. long; calyx-lobes erect, persistent; flesh thin, yellow, dry and mealy; it contains about 5 nutlets about 7 mm. long, ridged on the back, the nest about 7 mm. thick.

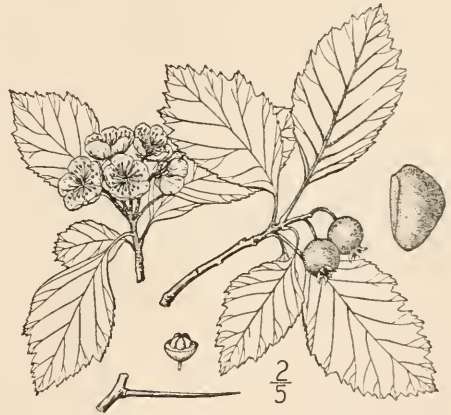


FIG. 407. — Berlandier's Thorn.

18. BOYNTON'S THORN — *Cratægus Boyntoni* Beadle

Cratægus intricata Sargent, not Lange

Boynton's thorn grows in open, rocky woods and in fields from western New England south along the Appalachian Mountains to northern Georgia and west-

ward to western New York and southern Missouri. It is a shrub 1 to 3 meters high in the North, but often a tree 6 meters high in the South, with ascending, unequal branches; the bark is dark grayish brown, commonly smooth; the twigs are reddish brown, smooth, and are armed with an occasional straight chestnut-brown spine 3 to 6 cm. long.



FIG. 408. — Boynton's Thorn.

above, 1 to 3 cm. long. The flowers are about 2 cm. wide, in smooth, few-flowered corymbs; the lanceolate calyx-lobes are pointed, glandular-toothed, the upper surface generally having a few hairs; stamens about 10; anthers light yellow. The fruit ripens late; it is depressed globose to pear-shaped, 10 to 15 mm. thick, yellow-green to yellow-brown, flushed with red, the calyx-lobes spreading, the flesh firm; it contains 3 or 4 nutlets 6 to 8 mm. long, strongly ridged on the back, the nest of nutlets 7 to 9 mm. thick.

19. WAXY THORN — *Crataegus pruinosa* (Wendland) K. Koch

Mespilus pruinosa Wendland

This species occurs in the Thousand islands, thence southward through western New England to the foothills of the southern Appalachians and westward to southern Wisconsin and Missouri. It is a tree sometimes 6 meters high, with ascending branches forming an irregular crown, or perhaps more often a shrub with numerous stems; the twigs are brown, becoming gray, smooth, and armed with numerous slender chestnut-brown spines 3 to 6 cm. long.

The leaves are elliptic to broadly



FIG. 409. — Waxy Thorn.

ovate, 2.5 to 6 cm. long, 2.5 to 6 cm. wide, pointed or sharply pointed at the apex, abruptly wedge-shaped, rounded or sometimes heart-shaped at the base, doubly toothed, with three or four pairs of pointed lobes; young leaves thin but firm, smooth, blue-green; leaf-stalks slightly winged above, glandular, 2 to 3 cm. long. The flowers are about 2 cm. broad, in few-flowered smooth corymbs; calyx-lobes triangular, long-pointed, remotely toothed, with red stalked glands; stamens 10 to 20; anthers light pink; styles 3 to 5. The fruit ripens late; it is depressed-globose, 5-angled, 12 to 15 mm. thick, apple-green, becoming a rich purple-red and covered with a waxy bloom; calyx-lobes erect, persisting; flesh firm, yellow, sweet, mealy, containing 3 to 5 nutlets, commonly 5, from 6 to 8 mm. long, ridged on the back, the nest 8 to 9 mm. thick.

20. BEADLE'S WOOD-THORN — *Cratægus silvicola* Beadle

Cratægus filipes Ashe. *Cratægus sequax* Ashe. *Cratægus Robbinsiana* Sargent

This thorn occurs from western New England south to central Georgia and northern Alabama and west to southern Michigan. It is a tree sometimes 9 meters high, with ascending branches forming a small crown; the bark is slightly scaly; the twigs are reddish brown becoming ashy-gray, smooth, and are armed with chestnut-brown curved spines 3 to 5 cm. long.

The leaves are triangular-ovate, 2 to 7 cm. long, 2 to 6 cm. wide, pointed or long-pointed at the apex, rounded or cut square, or, on the terminal shoots, heart-shaped at the base, doubly toothed, with three or four pairs of lobes, the lower lobes often cut; they are dark yellow-green, paler beneath, thin and smooth; leaf-stalks glandular, 1 to 2 cm. long. The flowers are about



FIG. 410. — Beadle's Wood-Thorn.

2 cm. wide in several-flowered smooth corymbs, the calyx-lobes broadly triangular, long-pointed, sometimes slightly hairy; stamens about 10; anthers pink; styles 3 to 5. The fruit ripens late; it is subglobose, about 15 mm. thick, greenish red, sometimes becoming cherry-red, slightly waxy when young; calyx-lobes spreading; flesh firm, yellow or reddish yellow, mealy; it contains 3 to 5 nutlets 6 to 8 mm. long, ridged on the back, the nest of nutlets 6 to 10 mm. thick.

21. BUSH'S THORN — *Cratægus pyriformis* Britton

Bush's thorn occurs in rich bottom lands of southeastern Missouri. It is a tree 8 to 9 meters high, with spreading branches forming a broad crown; the twigs are light green and long-hairy when young, becoming gray and smooth, and have an occasional slim, chestnut-brown spine 2 to 4 cm. long.



FIG. 411. — Bush's Thorn

The leaves are broadly oval or obovate-oval, 3 to 7 cm. long, 2 to 6 cm. wide, pointed at the apex, strongly wedge-shaped at the base, sharply and sometimes doubly toothed, usually slightly hairy on the upper surface when young, becoming smooth, hairy, especially along the veins beneath, yellow-green above, paler beneath, thin; leaf-stalks winged at the apex, woolly-hairy, becoming smoother, 1 to 3 cm. long. The flowers

are about 2.5 cm. wide, in many-flowered, long-hairy corymbs; calyx-tube densely long-hairy, the lobes lanceolate, long-pointed, slightly hairy, glandular-toothed; stamens about 20; anthers pink; styles 4 or 5. The fruit ripens late, is oblong or pear-shaped, about 12 mm. thick, bright cherry-red, calyx-lobes reflexed; flesh light yellow, juicy; it contains 4 or 5 nutlets about 8 mm. long and about 10 mm. thick; the nutlets are ear-shaped, and are grooved on the back.

22. ASHE'S THORN — *Cratægus Ashei* Beadle

Ashe's thorn is known in the clay soils about Montgomery, Alabama. It is a tree sometimes 6 meters high, with ascending branches forming an oval top; the bark is light gray or red-brown, becoming scaly with age; the twigs are orange-brown or reddish brown, hairy, becoming light gray, smooth, and provided with slender, nearly straight spines 3 to 4 cm. long.

The leaves are oblong-ovate or obovate, 2 to 8 cm. long, 1 to 6 cm. wide, abruptly long-pointed or pointed at the apex, wedge-shaped at the base, sharply toothed, sometimes doubly toothed, with erect teeth, hairy when young, the upper surface becoming simply rough with age,

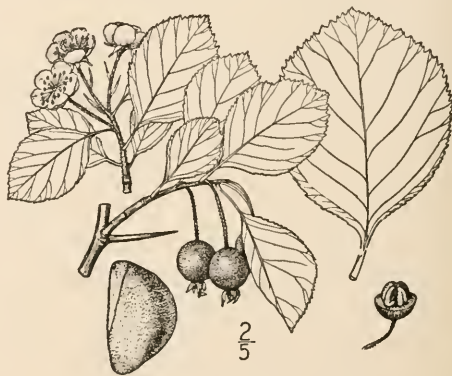


FIG. 412. — Ashe's Thorn.

thick, dark green and shining above, paler beneath; leaf-stalks broadly winged above, glandular, hairy, becoming smooth, about 1 cm. long. The flowers are about 2 cm. broad in few-flowered, long-hairy corymbs; calyx-tube long-hairy; calyx-lobes lanceolate, long-pointed, glandular-toothed, the outside nearly smooth, inner surface hairy; stamens about 20; anthers small, yellow; styles 3 to 5. The fruit, ripening about the first of October, is globose-oblong, about 2 cm. thick, bright red and hairy; calyx-lobes erect or incurved, persistent; flesh thick and yellow, containing 3 to 5 nutlets, 6.5 to 8 mm. long, the nest about 8 mm. thick; nutlets slightly grooved on the back, with a small sinus between them.

23. BRAZORIAN THORN — *Cratægus brazoria* Sargent

This species occurs in low rich woods on the banks of the Brazos river, Texas. It is a tree sometimes 8 meters high, with ascending branches forming a round-topped crown; the young twigs are slightly hairy, becoming smooth, and are unarmed, or occasionally armed with long gray spines.

The leaves are elliptic to ovate or obovate, 3 to 6 cm. long, 2 to 5 cm. wide, abruptly pointed or blunt at the apex, wedge-shaped at the base, doubly toothed, with three or four pairs of short pointed sometimes irregular lobes, the



FIG. 413. — Brazorian Thorn.

young leaves nearly smooth above, woolly-hairy beneath, particularly along the veins, becoming smooth, dark green above, paler beneath, thin but firm; leaf-stalks slightly winged at apex, woolly-hairy, becoming nearly smooth, 1 to 2 cm. long. The flowers are about 2 cm. broad in many-flowered, woolly-hairy corymbs; calyx hairy, the lobes lanceolate, long-pointed, glandular-toothed; stamens about 20; anthers small, dark red; styles 5. The fruit ripens about the first of October; it is subglobose, 8 to 12 mm. long, bright canary-yellow; flesh thin, light yellow, dry, but sweet; it contains 5 nutlets, which are 6 to 7 mm. long, 7 mm. thick, and grooved on the back.

24. BROWN'S THORN — *Cratægus Margaretta* Ashe

Cratægus Brownii Britton

This species occurs from Ontario to Maryland, western Virginia, central Iowa, Missouri, and middle Tennessee. It is a tree sometimes 8 meters high, or a large shrub, with erect branches forming a narrow open crown; the bark is dark gray-

brown; the twigs are orange-green, hairy, or sometimes smooth at first, and are armed with curved chestnut-brown spines 2 to 4 cm. long.



FIG. 414. — Brown's Thorn.

The leaves are oblong-obovate, sometimes ovate, 2 to 6 cm. long, 2 to 4 cm. wide, doubly toothed, with broad teeth and broad pointed lobes, bluntly pointed or rounded at the apex, wedge-shaped at the base, slightly hairy when young, becoming smooth, dark green above, paler beneath, half-leathery; leaf-stalks slightly winged above, glandular, 1 to 3 cm. long. The flowers are about 2 cm. wide, in few-flowered, nearly smooth corymbs; calyx-lobes linear, long-pointed, short-hairy, glandular-toothed; stamens about 20; anthers yellow;

styles 2 or 3. The fruit ripens late in September; it is short-oblong or subglobose, dull dark red or orange-red; calyx-lobes spreading or erect; flesh yellow, dry, mealy, containing 2 or 3 nutlets, commonly 2, about 6 mm. long, slightly ridged on the back, the nest of nutlets about 6 mm. thick.

25. ROUND-LEAVED THORN — *Crataegus rotundifolia* (Ehrhart) Moench

Mespilus rotundifolia Ehrhart

This species seems to range farther north than any other American thorn; it occurs in the rich, well-drained soil at the lower altitudes, particularly along the coast from Newfoundland and Lake St. John, Quebec, south through New England and the Alleghany Mountains to northern Virginia and west to Wisconsin and northern Illinois. It is a tree sometimes 7 meters high, but more often a beautiful round-topped shrub with ascending branches; the bark is dark red-brown, scaly; the twigs are red-brown, smooth, and bear many chestnut-brown curved spines 2 to 7 cm. long.

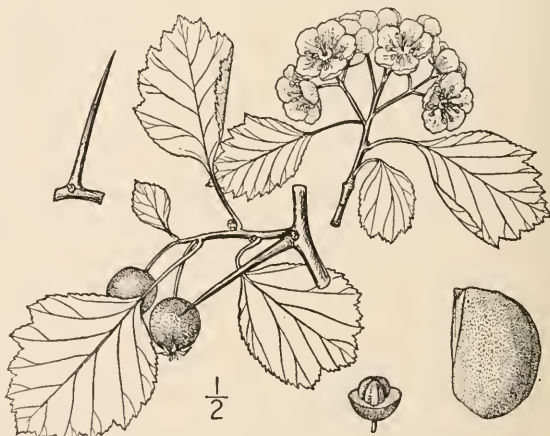


FIG. 415. — Round-leaved Thorn.

The leaves are ovate-orbicular or obovate, 3 to 6 cm. long, 2 to 6 cm. wide, pointed or long-pointed at the apex, wedge-shaped at the base, doubly toothed with

rather coarse appressed teeth and three or four pairs of pointed lobes, light yellow-green when young, thin, becoming leathery and dark green above, paler beneath; leaf-stalks slightly winged at the apex, glandular, 1 to 3 cm. long. The flowers are about 2 cm. wide in many-flowered, smooth corymbs; calyx-lobes linear, remotely glandular-toothed; stamens about 10; anthers pale yellow; styles 2 to 4. The fruit ripens in September and October; it is subglobose, about 10 mm. thick, dark red; calyx-lobes erect, conspicuous; flesh yellow, dry, sweet; it contains 2 to 4 nutlets 6 to 7 mm. long, ridged on the back, nest of nutlets 7 to 9 mm. thick.

Cratægus coccinea of Sargent seems to be a form of this, with slightly pubescent leaves, corymbs and fruits, with about the same range as the type.

26. MISS JONES' THORN — *Cratægus Jonesæ* Sargent

Miss Jones' thorn occurs on Mt. Desert island and the neighboring Maine coast. It is a tree sometimes 6 meters high, with spreading branches forming a broad, irregular crown; the bark is dark brown, scaly; the twigs are orange-brown, woolly-hairy, becoming smooth, and are armed with curved chestnut-brown spines 5 to 8 cm. long.

The leaves are elliptic-ovate, 4 to 10 cm. long, 3 to 8 cm. wide, abruptly pointed at the apex, wedge-shaped at the base, doubly toothed above, with 4 to 6 pairs of sharp-pointed flaring lobes, slightly hairy when young, particularly along the veins beneath, dark green and shining on the upper surface, paler beneath, leathery; leaf-stalks hairy, slightly winged above, 3 to 5 cm. long. The



FIG. 416. — Miss Jones' Thorn.

flowers are about 25 mm. wide, in many-flowered, long-hairy corymbs; calyx-tube woolly-hairy, the lobes abruptly long-pointed, remotely toothed, hairy; stamens about 10; anthers large, pink; styles 2 or 3. The fruit ripens in October; it is short-oblong to oblong pear-shaped, about 15 mm. thick, bright carmine-red, with a few short hairs; flesh yellow, mealy, sweet, the calyx-lobes appressed, conspicuous; it contains 2 or 3 nutlets, commonly 3, about 9 mm. long, strongly ridged on the back, the nest of nutlets about 8 mm. thick.

27. CHAPMAN'S HILL THORN — *Cratægus collina* Chapman

This species occurs in the hilly parts of the Appalachian Mountains from southwestern Virginia to central Georgia, and extends westward to southern Missouri and northern Mississippi. It sometimes ascends to 800 meters. It is a

tree from 6 to 8 meters high, with spreading branches forming a flat-topped head; the bark is dark gray, scaly; the young twigs are reddish, long-hairy, becoming gray and smooth, and armed with stout brown spines from 3 to 7 cm. long; the trunks are often provided with numerous, much-branched spines, from 15 to 20 cm. long.



FIG. 417. — Chapman's Hill Thorn.

The leaves are obovate-oblong or oval, from 2 to 6 cm. long and from 1.5 to 5 cm. wide, pointed at both ends, doubly toothed above, the young leaves slightly hairy above, paler beneath, with several pairs of oblique veins, becoming smooth above, yellow-green, half leathery; leaf-stalks about 1 cm. long, slightly hairy, sometimes winged. The flowers are about 15 mm. wide, in many-flowered, long-hairy corymbs; calyx-tube hairy, the lobes lanceolate, hairy outside, nearly smooth within, toothed with gland-tipped teeth; stamens about 20; anthers large, yellow; styles 3 to 5. The fruit, ripening in September, is globose, dull red, 9 to 12 mm. thick; the flesh is yellow, dry and mealy; it contains 3 to 5 nutlets, from 5 to 6.5 mm. long, the backs ridged, the nest of nutlets 6 to 8 mm. thick.

28. THIN-LEAVED THORN — *Crataegus tenuifolia* Britton

Crataegus Holmesiana Ashe, not *Crataegus Holmesii* Lesquereux

Crataegus villipes Ashe

This thorn occurs on rich, moist hillsides, from the vicinity of Montreal southward through western New England to the Appalachian foothills of southern Virginia, and westward through southern Ontario to northern Illinois. It is a tree sometimes 9 meters high, with strongly ascending branches, forming a long rounded crown; the bark is pale gray-brown, scaly; the twigs are reddish brown, smooth, and bear a few chestnut-brown spines 4 to 6 cm. long.

The leaves are elliptic-ovate, 2.5 to 9 cm. long, 2 to 6 cm. wide, pointed or long-pointed at the apex, wedge-shaped at the base, doubly toothed with sharp teeth, the 4 to 6 pairs of lobes with long-pointed, sometimes flaring tips, bronze-red when young, short-hairy above, becoming rough, yellow-green, paler and slightly hairy along the veins beneath, thin; leaf-stalks slightly hairy,

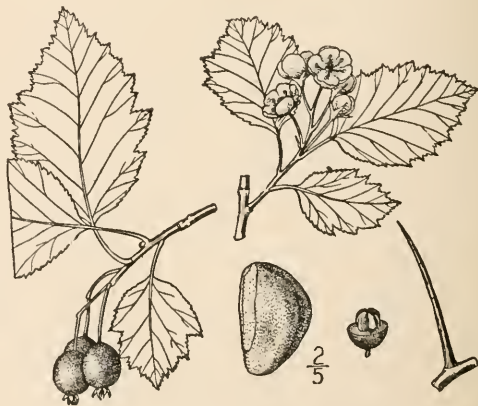


FIG. 418. — Thin-leaved Thorn.

glandular, 2 to 3 cm. long. The flowers are about 15 mm. wide in smooth or slightly hairy, many-flowered corymbs; calyx-lobes lanceolate, long-pointed, glandular-toothed; stamens 5 to 8; anthers pink; styles 3 to 5. The fruit ripens early, in August or September; it is pear-shaped or oblong, about 12 mm. thick, crimson; calyx-lobes erect or incurved, conspicuous; flesh yellow, mealy, acid; it contains 3 to 5 nutlets, commonly 4, 7 to 9 mm. long, ridged on the back, the nest of nutlets 6 to 8 mm. thick.

29. TWIN-MOUNTAIN THORN — *Cratægus pentandra* Sargent

This species occurs in the foothills of the Appalachian Mountains from Vermont to Virginia. It is sometimes a tree 5 meters high, but more often a much-branched shrub with ascending, unequal branches; the bark is brown, scaly; the young twigs are chestnut-brown, becoming gray, smooth, and armed with stout, curved reddish brown spines, from 3 to 5 cm. long.

The leaves are elliptic-ovate, 3 to 8 cm. long, 2 to 6 cm. wide, long-pointed at the apex, wedge-shaped at the base, sometimes nearly square cut, sharply and irregularly doubly toothed with erect sharp teeth, thin, dark green above with a few short hairs, paler and smooth beneath; leaf-stalks



FIG. 419. — Twin Mountain Thorn.

winged toward apex, 2 to 3 cm. long, glandular, with small glands. The flowers are about 15 mm. wide, in smooth, many-flowered corymbs; calyx-lobes ovate, long-pointed, with a few hairs on the upper surface, remotely glandular-toothed; stamens 5 to 10; anthers pink; styles 2 to 4. The fruit ripens in September; it is short-oblong, dark crimson, about 15 mm. long and 10 mm. thick; calyx-lobes incurved; flesh succulent and mealy, acid, containing 2 to 4 nutlets (commonly 3), 6 to 8 mm. long; nest 6 to 8 mm. thick; nutlets ridged on the back, ends acute.

30. EGGERT'S THORN — *Cratægus coccinioides* Ashe

Cratægus Eggertii Britton

Eggert's thorn occurs from the vicinity of Montreal through western New England to Missouri and eastern Kansas. It is a tree sometimes 6 meters high, with spreading branches forming a broad round-topped crown; the bark is grayish brown, scaly; the twigs are chestnut-brown, smooth, and are armed with chestnut-brown curved spines from 2 to 6 cm. long.

The leaves are broadly ovate, 4 to 9 cm. long, 3.5 to 8 cm. wide, pointed at the apex, rounded or square cut at the base, doubly toothed with erect teeth,

usually with several pairs of spreading broad-pointed or pointed lobes, green, thin but firm, slightly hairy on the veins beneath; leaf-stalks glandular, slightly hairy, 2 to 3 cm. long. The flowers are about 20 mm. wide in few-flowered, smooth corymbs, the calyx-lobes ovate, pointed, remotely glandular-toothed; stamens about 20; anthers pink; styles 3 to 5. The fruit ripens late; it is subglobose, 5-angled, about 20 mm. thick, dark crimson; the calyx-lobes are erect, conspicuous; flesh firm, tinged with red, subacid; it contains 3 to 5 nutlets, usually 5, 7 to 9 mm. long, grooved on the back, the nest of nutlets 9 to 11 mm. thick with a deep sinus between the nutlets.



FIG. 420. — Eggert's Thorn.

Crataegus dilatata Sargent is an eastern form, with bright red fruit and larger corymbs.

31. PRINGLE'S THORN — *Crataegus Pringlei* Sargent

Pringle's thorn grows from western New England southward to Pennsylvania and westward to southern Ontario, Michigan, and northern Illinois. It is a tree sometimes 8 meters high, with ascending branches forming a broad round-topped crown; the bark is thin, scaly and red-brown; the twigs are chestnut-brown, hairy, becoming gray and smooth, the curved chestnut-brown spines from 3 to 5 cm. long.

The leaves are ovate-oval, 3 to 9 cm. long, 2.5 to 8 cm. wide, broadly pointed at the apex, rounded or abruptly wedge-shaped at the base, doubly toothed, the terminal leaves often with several pairs of broad-pointed or pointed lobes, bronze-green and hairy when young, becoming bright yellow-green and smooth above, paler beneath, hairy along the veins, becoming nearly smooth, thin; leaf-stalks hairy, glandular, 1 to 3 cm. long. The flowers are about 2 cm. wide, in many-flowered, hairy (sometimes nearly smooth) corymbs; calyx-tube slightly hairy, the lanceolate long-pointed lobes nearly smooth, glandular-toothed; stamens 5 to 20; anthers pink; styles 3 to 5. The fruit ripens about the first of October; it is short-oblong, about 15 mm. thick, red and hairy;



FIG. 421. — Pringle's Thorn.

calyx-lobes erect, persistent; flesh thick, yellow, acid, often quite edible; it contains 3 to 5 nutlets 7 to 9 mm. long, grooved and ridged on the back, the nest 7 to 9 mm. thick.

This species is quite variable; the typical form has about ten stamens. *C. lobulata* Sargent is a form with more deeply cut leaves; *C. polita* Sargent, a smoother, and *C. exclusa* Sargent, a more hairy form; *C. neo-londonensis* Sargent, and *C. Hillii* Sargent, are twenty stamened forms with rougher leaves.

32. BUCKLEY'S THORN — *Cratægus texana* Buckley

Buckley's thorn occurs in the rich bottom lands of central and western Texas. It is a tree sometimes 10 meters high, with ascending branches forming a broad round-topped crown; the bark is scaly; the twigs are hairy, becoming smooth, dull reddish brown, and bear occasional chestnut-brown spines about 5 cm. long.

The leaves are broadly ovate, 5 to 10 cm. long, 3 to 8 cm. broad, pointed or rounded at the apex, wedge-shaped at the base, doubly toothed, sometimes slightly lobed and the base square cut, hairy when young, becoming dark green and smooth above, paler beneath; leaf-stalks slightly hairy, winged above, 1 to 3 cm. long. The flowers are about 2 cm. wide, in many-flowered woolly-hairy corymbs; calyx-tube and ovate long-pointed lobes densely woolly-hairy, lobes sharply glandular-toothed; stamens about 20; anthers dark pink; styles about 5. The fruit ripens about the last of October; it is short-oblong to pear-shaped, 12 to 18 mm. thick, bright scarlet, hairy; calyx-lobes erect; flesh soft and thick, yellow, sweet and edible; it contains 5 nutlets 7 to 9 mm. long, ridged on the back, the nest of nutlets 8 to 10 mm. thick.



FIG. 422. — Buckley's Thorn.

33. NASHVILLE THORN — *Cratægus grävada* Beadle

Limestone hills about Nashville, Tennessee, are the home of this thorn. It is a tree sometimes 6 meters high, with wide-spreading branches, forming a broad round-topped crown; the bark is dark brown, scaly; the twigs are orange-red, woolly-hairy at first, becoming smooth, and are armed with straight chestnut-brown spines 3 to 6 cm. long.

The leaves are broadly ovate, pointed at the apex, abruptly wedge-shaped or truncate at the base, doubly toothed, with 4 or 5 pairs of low lobes, short-hairy on the upper surface when young, becoming nearly smooth, woolly-hairy particu-



FIG. 423. — Nashville Thorn.

larly along the veins below, thin and firm, dark green above, paler below, 2.5 to 9 cm. long, 2 to 8 cm. wide; leaf-stalks slightly winged toward the apex, woolly-hairy, 1 to 2 cm. long. The flowers are about 15 mm. wide, in many-flowered, woolly-hairy corymbs; calyx-tube densely woolly-hairy, the lanceolate, long-pointed lobes less hairy, glandular-toothed; stamens about 20; styles 5. The fruit ripens in August or September; it is depressed-globose, 12 to 15 mm. thick, red, hairy, calyx-lobes reflexed; flesh thin, yellow, dry and mealy; it contains 5 nutlets 7 to 8 mm. long, the nest 10 to 11 mm. thick; nutlets lightly grooved on the back, with a deep sinus between them.

34. RED-FRUITED THORN—*Crataegus mollis* (Torrey and Gray) Scheele

Crataegus coccinea mollis Torrey and Gray

This species, also called Red haw, occurs from the Isle of Orleans, Quebec, through western New England southward to Tennessee, and west to South Dakota, eastern Nebraska, and Arkansas. It is a tree sometimes 13 meters high, with wide-spreading branches, forming a broad round-topped crown; the bark is grayish brown, fissured and scaly; the twigs are covered with dense woolly hairs when young, soon becoming smooth, and are armed with chestnut-brown, curved spines, from 3 to 5 cm. long.

The leaves are broadly ovate, pointed at the apex, cut square or heart-shaped at the base, doubly toothed, with sharp teeth and 4 or 5 pairs of sharp lobes, 4 to 13 cm. long, 4 to 10 cm. wide, with appressed hairs on the upper surface, becoming roughish, woolly-hairy beneath, half-leathery, yellow-green; leaf-stalks woolly-hairy, sometimes glandular when young, sometimes nearly smooth when mature, from 2 to 4 cm. long.

The flowers, about 20 mm. wide, are in many-flowered, woolly-hairy corymbs; calyx densely woolly-hairy, the lobes toothed or cut, glandular; stamens 10 to 20; anthers large, light yellow; styles 4 or 5. The fruit, ripening late in August or September, is short-oblong, subglobose or pear-shaped, 15 to 25 mm. thick, red



FIG. 424. — Red-fruited Thorn.

or crimson; the calyx-lobes are erect, hairy; the flesh yellow, mealy, acid, containing 4 or 5, commonly 5, nutlets 7 to 9 mm. long, the nest 8 to 10 mm. thick, the backs of nutlets grooved, and with a deep sinus between them.

This runs into many forms. *Cratægus submollis* Sargent is a form with 10 stamens and generally early ripening fruit, occurring in eastern Canada and New England. *Cratægus champlainensis* Sargent is a later fruiting form with 10 stamens, with about the same range.

35. CANADIAN THORN — *Cratægus canadensis* Sargent

Cratægus canadensis is known to occur only on the limestone ridges along the St. Lawrence river above Montreal at Caughnawaga. It is a tree sometimes 9 meters high, with spreading branches, forming a large rounded topped crown; twigs orange-brown, hairy when young, becoming smooth, armed with numerous curved, chestnut-brown spines from 3 to 7 cm. long.

The leaves are broadly ovate to oval, 3 to 8 cm. long, 3 to 8 cm. wide, pointed at the apex, rounded or cut square at the base, doubly toothed, with sharp, erect teeth, slightly hairy on the upper surface, becoming nearly

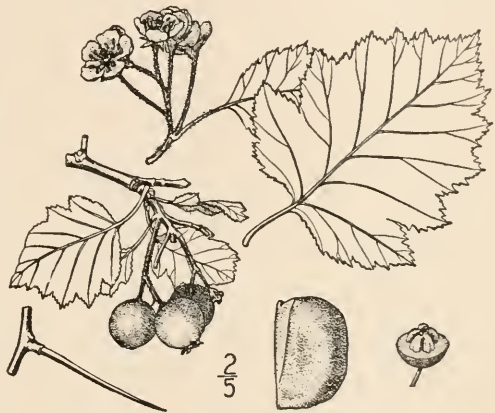


FIG. 425. — Canadian Thorn.

smooth, woolly-hairy, particularly along the veins, beneath, thin, blue-green; leaf-stalks woolly-hairy, becoming nearly smooth, glandular, winged, 2 to 3 cm. long. The flowers are about 15 mm. wide in many-flowered woolly-hairy corymbs; calyx-tube and lanceolate long-pointed, glandular-toothed lobes woolly-hairy; stamens about 20; anthers small, yellow; styles 5. The fruit, which ripens in October, is short-oblong to globose, about 15 mm. thick, scarlet, slightly hairy, its calyx-lobes spreading, prominent; flesh pale yellow, dry, mealy and acid; it contains 5 nutlets, 6 to 8 mm. long, grooved on the back, the nest about 8 to 9 mm. thick.

36. WOOLLY THORN — *Cratægus lanuginosa* Sargent

This species occurs in southwestern Missouri, where it reaches a maximum height of 8 meters, with spreading and erect branches; the twigs are densely woolly-hairy at first, becoming smooth, and are armed with many straight chestnut-brown spines from 3 to 9 cm. long; the thorns of the terminal shoots are leafy at first, the leaves disappearing with age.

The leaves are ovate to suborbicular, 2.5 to 7 cm. long, 2 to 6 cm. wide, pointed at the apex, wedge-shaped or cut square at the base, coarsely doubly



FIG. 426. — Woolly Thorn.

toothed, densely white woolly-hairy on the lower surface, with rigid appressed hairs on the upper surface when immature, becoming merely rough, dark green above, half-leathery; leaf-stalks woolly-hairy, 5 to 25 mm. long. The flowers, about 2 mm. broad, are in many-flowered white woolly-hairy corymbs; calyx densely woolly-hairy, the lobes ovate, long-pointed, glandular-toothed; stamens about 20; anthers pink; style 5. The fruit, ripening the last of October, is subglobose to short-oblong, about 15 mm. thick, bright cherry-red, woolly-hairy on the ends, its calyx-lobes spreading; flesh orange, dry and mealy, containing 5 nutlets, 6 to 8 mm. long, grooved on the back, the nest of nutlets 8 to 11 mm. thick, with a deep sinus between nutlets.

37. WASHINGTON THORN — *Crataegus Phænopyrum* (Linnæus fil.) Medicus

Crataegus cordata Aiton, not *Mespilus cordata* Miller. *Mespilus Phænopyrum*
Linnæus fil.

This species grows in moist, rich soil along streams, from Virginia, south along the foothills of the Appalachian Mountains to northern Georgia and Alabama, and from the lower Wabash valley in Illinois to southern Missouri and northwestern Arkansas. It is often cultivated, and has become naturalized as far north as Delaware and eastern Pennsylvania. It is frequently a large, spreading shrub, and sometimes becomes a tree 9 meters high, with nearly erect branches forming an oblong head; the bark is grayish brown, scaly; the twigs are chestnut-brown, smooth, bearing slightly curved spines 2 to 5 cm. long.

The leaves are broadly ovate to triangular, 2 to 8 cm. long, 2 to 8 cm. wide, pointed or long-pointed at the apex, rounded or heart-shaped at the base, 3- to 7-lobed, 3 of the lobes generally strongly marked, toothed or doubly toothed, with pointed teeth, smooth, or with a few hairs along the veins when young, bright green above,



FIG. 427. — Washington Thorn.

paler beneath, firm; leaf-stalks smooth, 1.5 to 5 cm. long. The flowers, about 10 mm. wide, are in smooth many-flowered corymbs; calyx-lobes triangular, hairy on the margin; stamens about 20; anthers pink; styles 4 or 5. The fruit, ripening late in September, is depressed-globose, 4 to 6 mm. thick, scarlet; flesh thin and firm; it contains 4 or 5, commonly 5, nutlets, 3 to 4 mm. long, with a conspicuous calyx scar, shallow sinus, smooth back, the nest 3.5 to 5.5 mm. thick.

38. MAY HAW — *Cratægus æstivalis* (Walter) Torrey and Gray

Mespilus æstivalis Walter

The May haw occurs in shallow ponds in the pinelands, and on low banks of streams from South Carolina to northern Florida and west to southern Arkansas and the Sabine River, Texas. It is also called Apple haw. It is a tree from 5 to 9 meters high, or a large shrub with several stems, with a close round-topped crown; the bark is dark reddish brown, scaly; the twigs are reddish, hairy, becoming smoother, and are sometimes armed with reddish spines from 3 to 4 cm. long.

The leaves are oblanceolate to oval, from 2 to 7 cm. long, and from 1.5 to 4 cm. wide, pointed or broadly pointed at the apex, markedly wedge-shaped at the base, crenate, doubly crenate-toothed, cut or often lobed, often irregularly so; young leaves densely rusty woolly-hairy beneath, less so above; mature leaves becoming rough above, dark green, half-leathery; leaf-stalks about 1 cm. long, rusty woolly-hairy. The flowers are about 25 mm. wide, in 2- to 5-flowered simple glabrous corymbs, and appear with the leaves in February and March; the calyx-lobes are ovate, long-pointed, remotely glandular-toothed; stamens about 20; anthers purple; styles 3 to 5. The fruit, ripening in May, is depressed-globose, red, dotted, 12 to 15 mm. thick, its calyx spreading; flesh thick, juicy, subacid; it contains 3 to 5 nutlets, 4 to 7 mm. long, the nest 6 to 9 mm. thick; the nutlets are slightly ridged on the back, with a deep sinus between them. The fruit is used largely for preserves and jellies.



FIG. 428. — May Haw.

39. PARSLEY-LEAVED THORN — *Cratægus Marshallii* Eggleston

Mespilus apiifolia Marshall. *Cratægus apiifolia* Michaux, not Medicus

This species grows along streams and borders of swamps from Virginia to Florida westward to Missouri and Texas. It is a shrub or a small tree 2 to 6 meters high, with nearly horizontal branches, forming a wide irregular top; the bark is

gray, smooth; the twigs are light red, woolly hairy with long hairs, becoming smooth, with an occasional chestnut-brown, straight spine 2.5 to 4 cm. long.



FIG. 429. — Parsley-leaved Thorn.

The leaves are broadly ovate to orbicular, 1 to 4 cm. long, 1 to 4 cm. wide, white hairy on the under surface when young, somewhat hairy above, becoming smooth, pointed or rounded at the apex, heart-shaped to wedge-shaped at the base, pinnately 5- to 7-cleft, the lobes toothed and often doubly toothed with sharp teeth, thin; leaf-stalks hairy, becoming smooth, 2.5 to 5 cm. long. The flowers are about 15 mm. wide, in 3- to 12-flowered short-hairy corymbs, the calyx-lobes lanceolate, long-pointed, glandular-toothed, with red-tipped teeth, smooth on the outside, slightly short-hairy above; stamens about 20; anthers pink; styles 1 to 3.

The fruit ripens in October; it is oblong or oval, 4 to 7 mm. long, scarlet; calyx-lobes reflexed; the flesh is thin, firm, enclosing 1 to 3 nutlets, commonly 2, 5 to 6.5 mm. long, with smooth back, no sinus, rounded at calyx and pointed at stem end, with calyx-scar, the nest 3 to 3.5 mm. thick.

40. SMALL-FRUITED THORN — *Crataegus spathulata* Michaux

This thorn occurs in moist, rich soil of the coast region, from Virginia to northern Florida and westward to southern Arkansas and Oklahoma to Texas. It is a shrub or small tree 6 to 8 meters high, with upright and spreading branches, forming a broad open crown; the bark is grayish brown, minutely scaly; the twigs are light reddish brown, smooth, and occasionally provided with straight, brown spines 3 to 4 cm. long.

The leaves are spatulate to oblanceolate, 1 to 4 cm. long, 5 to 20 mm. wide, pointed or rounded at the apex, gradually narrowed below from about the middle into winged petioles, crenate-toothed, often 3- to 5-lobed above, with 3 conspicuous lobes, hairy on the veins above when young, becoming smooth, half-leathery, dark green above, lighter beneath; leaf-stalks about 1 cm. long. The flowers are about 10 mm. wide, in many-flowered, smooth corymbs;



FIG. 430. — Small-fruited Thorn.

calyx-lobes triangular; stamens about 20; anthers red; styles 3 to 5. The fruit ripens late; it is globose to subglobose, red, 4 to 6 mm. thick, calyx-lobes reflexed; flesh dry and mealy; it contains 3 to 5 nutlets, 3 to 3.5 cm. long, the nest 3.5 to 4.5 mm. thick, the calyx-scar conspicuous.

41. ENGELMANN'S THORN — *Cratægus brachyacantha* Engelmann and Sargent

Engelmann's thorn grows in moist soil in southern Arkansas, Louisiana, and Texas. It is a tree sometimes 15 meters high, with spreading branches, forming a round-topped crown; the bark is dark brown, deeply furrowed; the twigs are reddish brown, smooth, and are armed with curved spines 1 to 2 cm. long, and the ends of the branches often terminate in spines.

The leaves are oblanceolate-elliptic or narrowly ovate, 2.5 to 5 cm. long, 1 to 2.5 cm. wide, pointed or rounded at the apex, wedge-shaped decurrent below, crenate-toothed, smooth, half-leathery, dark green and shining above, paler beneath, the veins



FIG. 431. — Engelmann's Thorn.

not very conspicuous; leaf-stalks narrowly wing-margined above, 1 to 2 cm. long. The flowers are about 10 mm. wide in smooth, many-flowered corymbs; calyx-lobes short-pointed; stamens 15 to 20; styles 3 to 5. The fruit ripens early; it is subglobose, about 10 mm. thick, blue-black, with a glaucous bloom; calyx-lobes spreading; flesh thin; it contains 4 or 5 nutlets 5 to 6.5 mm. long, the nest 5.5 to 8 mm. thick.

42. HOWELL'S THORN — *Cratægus columbiana* Howell

Howell's thorn occurs commonly along the tributaries of the Columbia River, east of the Cascade Mountains, and extends east to central-northern North Dakota, and north into British Columbia. It is a much-branched shrub or small tree, sometimes 5 meters high; the twigs are reddish brown, smooth, and bear some chestnut-brown spines from 2 to 6 cm. long.

The leaves are thin, wedge-shaped, ovate or oblong, 2 to 6 cm. long, 1 to 5 cm. wide, with 3 or 4 pairs of sharp lobes, the lower pair often quite deeply cut, sharply and finely doubly toothed, sparingly long-hairy, particularly along the veins; leaf-

stalks slightly long-hairy, glandular, winged above, about 15 mm. long. The



FIG. 432. — Howell's Thorn.

flowers are about 15 mm. broad, in somewhat long-hairy, many-flowered corymbs; calyx-tube nearly smooth; calyx-lobes triangular, long-pointed, smooth on the outside, slightly long-hairy on the inside, remotely glandular-toothed, red-tipped; stamens about 10; styles 3 or 4. The fruit, ripening in September, is pear-shaped or oblong, 8 to 12 mm. long, scarlet, its calyx-lobes spreading, persistent; the flesh is pulpy when ripe; it contains 3 or 4 nutlets 6 to 8 mm. long, 6 to 7 mm. thick, strongly ridged on the back, with a shallow pit on each inner surface.



43. ST. LAWRENCE THORN — *Crataegus laurentiana* Sargent

This thorn grows along the lower St. Lawrence River, and from northern Michigan to British Columbia, eastern Oregon and central Colorado. It is a many-branched shrub or a small tree sometimes 5 meters high, with irregular branches; the twigs are slightly hairy, soon becoming smooth, bright orange-brown, and bear stout chestnut-brown spines from 3 to 8 cm. long.

The leaves are oblong to oblong-ovate, sharply or bluntly pointed at the apex, strongly wedge-shaped at the base, sharply and doubly toothed, with three to five pairs of pointed lobes, 3 to 8 cm. long, 1.5 to 4 cm. broad, slightly hairy, particularly along the veins when young, becoming smooth, except along the veins beneath, half-leathery, dark green above, paler beneath; leaf-stalks slightly winged toward the apex, hairy, becoming smooth, 1 to 2 cm. long. The flowers are about 15 mm. broad, in many-flowered, whitish woolly-hairy corymbs; calyx-tube densely white woolly-hairy, the lanceolate, long-pointed lobes hairy or nearly smooth, glandular-toothed; stamens about 10; anthers small, pale pink; styles 4 or 5. The fruit ripens in September, is oblong, dark crimson, slightly hairy, about 10 mm. long, its calyx-lobes reflexed, persistent; the flesh is yellow, becoming soft, succulent



FIG. 433. — St. Lawrence Thorn.

and sweet when mature; it contains 4 or 5 nutlets 6 to 7 mm. long, strongly ridged on the back, with a shallow pit on each inner face, the nest 7 to 8 mm. thick.

44. PRAIRIE THORN — *Crataegus pertomentosa* Ashe

Crataegus campestris Britton

This species is found in rocky barrens from western Missouri and eastern Kansas to central Iowa. It is a tree sometimes 5 meters high, with nearly horizontal branches, forming a flattened crown; the bark is dark gray; the twigs are reddish brown, hairy, soon becoming smooth and armed with numerous chestnut-brown curved spines from 3 to 9 cm. long.

The leaves are oblong to ovate, 3 to 7 cm. long, 2 to 6 cm. wide, sharply and finely doubly toothed, with 4 or 5 pairs of small abruptly sharp-pointed lobes, pointed at the apex, broadly wedge-shaped or rounded at the base, slightly long-hairy above, particularly along the veins when young, becoming smooth, hairy beneath, more thickly along the veins, half leathery, bright dark green above, paler beneath; leaf-stalks about 1 cm. long, winged, slightly hairy, glandular. The flowers are about 2 cm. wide, in many-flowered densely long-hairy corymbs; calyx-tube densely long-hairy, the lanceolate long-pointed lobes deeply toothed, with glandular tips, hairy on the inside, nearly smooth without; stamens 10 to 15; styles 2 or 3. The fruit, ripening in September, is 8 to 13 mm. thick, round, cherry-red, hairy when young; flesh yellow, succulent, becoming mealy when mature, enclosing 2 or 3 nutlets 5 to 6.5 mm. long, ridged on the back and pitted on the inner face, pits varying from shallow to deep and occasionally wanting on individual nutlets, the nest of nutlets 5 to 6.5 mm. thick.



FIG. 434. — Prairie Thorn.

45. ROUGH-LEAVED THORN — *Crataegus asperifolia* Sargent

Crataegus Deweyana Sargent. *Crataegus McGeei* Ashe

This thorn occurs from western Nova Scotia to Iowa. It is a tree sometimes 8 meters high, with the lower branches horizontal and the upper ones ascending,

forming a wide, irregular crown; the bark is light gray, scaly; the twigs are red-brown, with numerous curved spines from 3 to 5 cm. long.

The leaves are elliptic-ovate, 4 to 8 cm. long, 3 to 7 cm. wide, pointed or abruptly long-pointed at the apex, abruptly wedge-shaped or rounded at the base, doubly toothed and lobed above, thin, yellow-green, slightly hairy above when young, becoming rough, smooth beneath; leaf-stalks slightly winged, 2 to 4 cm. long. The flowers are about 15 mm. wide, in many-flowered, hairy corymbs; calyx-tube long-hairy below, the lobes smooth on the under surface, long-hairy on the upper surface, glandular-toothed, with small teeth; stamens 7 to 10; anthers small, dark rose; styles 2 or 3. The fruit ripens about the middle of October; it is subglobose

to short-oblong, about 15 mm. thick, scarlet; its calyx-lobes are erect or incurved; flesh thick, yellow; pedicels hairy; it contains 2 or 3 nutlets 7 to 8 mm. long, with strongly ridged backs, and with shallow longitudinal pits on the inner face, the nest of nutlets 7 to 8 mm. thick.



FIG. 435. — Rough-leaved Thorn.

46. BRAINERD'S THORN — *Crataegus Brainerdi* Sargent

Crataegus Schuettei Ashe. *Crataegus Forbesae* Sargent

Brainerd's thorn is common in western New England and ranges south to Pennsylvania and west to northern Illinois and Wisconsin. It is commonly a round-topped shrub, but often a tree 6 meters high, with ascending branches; the scaly bark is gray-brown, the twigs reddish brown, smooth, and armed with chestnut-brown spines from 3 to 6 cm. long.

The leaves are ovate, 3 to 9 cm. long, 2 to 6 cm. wide, broadly wedge-shaped at the base, pointed at the apex, doubly toothed, with 4 to 6 pairs of short-pointed lobes, slightly hairy on the upper surface when young, rather thin, bright green above, paler beneath; the leaf-stalks are slightly winged above, 1 to 2 cm. long. The flowers are about 2 cm. broad, in many-flowered, smooth corymbs; calyx-



FIG. 436. — Brainerd's Thorn.

lobes linear, long-pointed, smooth on the outside, slightly long-hairy on the inside, remotely glandular-toothed; stamens 10 to 20; anthers pink; styles 2 to 4. The fruit, which ripens the last of September, is oblong to nearly round, about 10 mm. thick, cherry-red; the flesh is yellow, mealy, soft and acid; it contains 2 to 4 nutlets, 5 to 7 mm. long, 5 to 7 mm. thick, ridged on the back, the inner faces having a shallow pit, but the pit is sometimes faint or wanting on individual nutlets.

Crataegus scabrida Sargent is a form commonly having about ten stamens and with the upper surface of the leaves rougher. This occurs in New England and New York.

Crataegus Egglestoni Sargent is a 10-stamened form with slightly pubescent corymbs and rounder leaves. This is the most common form of the Green Mountains and perhaps of the Adirondacks, ascending to nearly 800 meters in the Green Mountains.

Crataegus cyclophylla Sargent appears to be a 20-stamened form.

47. LONG-SPINED THORN — *Crataegus macracantha* Loddiges

This species grows on rich hillsides, commonly on limestone, from Nova Scotia south through New England to Pennsylvania and west along the Great Lakes to southeastern Minnesota and northern Illinois. It is a tree sometimes 6 meters high, with ascending and wide-spreading branches, forming an irregular broad crown; the bark is gray; the twigs are smooth, shining, chestnut-brown, with numerous chestnut-brown curved spines from 4 to 10 cm. long.

The leaves are rhombic-ovate to obovate, from 3 to 8 cm. long, 2.5 to 6 cm. wide, slightly hairy on the lower surface, sometimes a little hairy above when young, becoming smooth except along the veins beneath, pointed at the apex, wedge-shaped at the base, doubly toothed, with lobes toward the apex, dark green and shining above, paler beneath, leathery; the leaf-stalks are slightly winged, 1 to 2 cm. long. The flowers are about 2 cm. wide, in many-flowered, short-hairy corymbs; calyx hairy, the lobes sometimes nearly smooth, lanceolate, long-pointed and with long-pointed gland-tipped teeth; stamens 10 to 20, commonly about 10; anthers white to pink; styles 2 or 3. The fruit, ripening in September, is globose, hairy, its calyx-lobes reflexed; the flesh is yellow, sweet and pulpy, containing 2 or 3 nutlets, 5 to 7 mm. long, ridged on the back, the front or inner surfaces deeply pitted, the nest of nutlets 5 to 7 mm. thick.



FIG. 437. — Long-spined Thorn.

This species runs into numerous forms. *Cratægus succulenta* Schrader has about 20 stamens and larger fruit with larger nutlets. *C. rhombifolia* Sargent has smaller fruit and nutlets, about 10 stamens and more hairy corymbs. *C. integriloba* Sargent has entire calyx-lobes and about 10 stamens; it is common about Montreal, Canada.

48. PEAR THORN — *Cratægus Chapmani* (Beadle) Ashe

Cratægus tomentosa *Chapmani* Beadle

This species occurs from central New York, southward through western New Jersey and along the foothills of the Appalachian Mountains to northern Georgia and westward through southern Ontario to southern Minnesota, eastern Kansas, and Missouri. It is also called Pear haw. It is a tree sometimes 7 meters high, with ascending or spreading branches, forming a broad crown; the bark is pale gray to dark brown, furrowed; the twigs are dark orange and tomentose when young, becoming gray and smooth and are occasionally armed with slender spines 3 to 5 cm. long.



FIG. 438. — Pear Thorn.

The leaves are rhombic-ovate, 4 to 11 cm. long, 3 to 8 cm. wide, pointed or long-pointed at the apex, wedge-shaped

at the base, doubly toothed and generally lobed, hairy on the upper surface when young, becoming rough, hairy beneath, particularly along the veins, thin, gray-green; leaf-stalks wing-margined, glandular-hairy, about 2 cm. long. The flowers are about 15 mm. wide, in many-flowered, whitish woolly-hairy corymbs; the calyx-lobes are lanceolate, long-pointed, less hairy than the tube; stamens 10 to 20; anthers small, pink; styles 2 or 3. The fruit ripens late; it is pear-shaped or oval, 10 to 15 mm. long, orange-red; pedicels hairy; flesh yellow, thick; nutlets 2 to 3, 5 to 7 mm. long, the nest 5 to 6 mm. thick.

49. DOUGLAS' THORN — *Cratægus Douglasii* Lindley

Cratægus punctata brevispina Douglas. *Cratægus brevispina* Farwell

Douglas' thorn occurs along banks of streams from British Columbia to northern California and eastward in the northern Rocky Mountains to the Bighorn Mountains in Wyoming; on the shores of Lake Superior in northern Michigan, and on Michipicotin island. It is a tree sometimes 12 meters high, with ascending branches forming a round-topped crown; the twigs are reddish, smooth, and armed with short, stout, red spines from 1 to 3 cm. long.

The leaves are ovate or obovate to broadly ovate, 2 to 7 cm. long, 1 to 6 cm. wide, pointed or short-pointed at apex, wedge-shaped at base, doubly toothed and lobed, covered with pale hairs, particularly along the veins above, dark green above, half-leathery, seldom becoming smooth along the veins; leaf-stalks slightly winged, hairy, glandular, 1 to 3 cm. long. The flowers are about 15 mm. wide, in many-flowered smooth or short-hairy corymbs; calyx-lobes short-pointed to long-pointed, generally long-hairy above and often tinged with red; stamens 10 to 20; anthers light yellow; styles 3 to 5. The fruit, which ripens early, is short-oblong and black, its flesh yellow and sweet; it contains 3 to 5 nutlets, commonly 4, 5 to 6 mm. long, the nest of nutlets 5 to 7 mm. thick; the nutlets are ear-shaped, pointed below, ridged on the back, the inner surface bearing rough shallow pits.



FIG. 439. — Douglas' Thorn.

50. NUTTALL'S THORN — *Crataegus rivularis* Nuttall

Crataegus Wheeleri Rydberg

Nuttall's thorn occurs about the banks of mountain streams from southeastern Idaho and southwestern Wyoming, southward through the Wahsatch Mountains to southwestern Colorado and westward to the Clover Mountains, Nevada. It is a tree sometimes 6 meters high, with strongly ascending branches, forming a long crown; the bark is dark brown, scaly; the twigs are bright red-brown, occasionally armed with slender spines 1.5 to 4 cm. long.



FIG. 440. — Nuttall's Thorn.

The leaves are lanceolate to narrowly elliptic, 2.5 to 8 cm. long, 1.5 to 4.5 cm. wide, long-pointed or pointed at the apex, strongly wedge-shaped at the base, toothed or slightly doubly toothed, the teeth gland-tipped, hairy, particularly along the veins on the upper surface,

smooth beneath, thin, dull bluish green above, paler beneath; leaf-stalks winged towards the apex, slightly hairy, 1 to 2 cm. long. The flowers are about 12 mm. broad, in many-flowered, smooth corymbs; calyx-lobes lanceolate, long-pointed, slightly hairy on the upper surface, remotely glandular-toothed, tipped with red;

stamens about 20; anthers yellow; styles 3 to 5. The fruit ripens in September; it is short-oblong, about 8 mm. thick, dark crimson, becoming black; calyx-lobes reflexed; flesh yellow, succulent, mealy; it contains 3 to 5 nutlets 5 to 6 mm. long, the nest 5 to 7 mm. thick; nutlets ear-shaped, ridged on the back, the inner surface roughened with shallow pits.

51. GREENE'S THORN — *Cratægus saligna* Greene

Greene's thorn grows on the banks of streams of the continental divide in central and southern Colorado, at altitudes from 2000 to 2500 meters. It is a tree sometimes 6 meters high, with long, spreading, or drooping branches; the bark is reddish-brown, scaly on old trees; the twigs are bright red, smooth, and armed with straight, slender, bright red spines from 5 to 25 mm. long.

The leaves are thick, rhombic-lanceolate, 1.5 to 5 cm. long, 0.5 to 2 cm. broad, rounded, short, or taper-pointed at the apex on the terminal shoots, wedge-shaped at the base, glandular-toothed with short, flattened teeth, those of the terminal shoots toothed or doubly toothed, slightly hairy on the upper surface, particularly



FIG. 441. — Greene's Thorn.

along the veins, smooth beneath, dark green and shining above, paler beneath; leaf-stalks winged towards the top, slightly hairy, about 1 cm. long. The flowers are about 10 mm. wide, in smooth corymbs; calyx-lobes smooth, triangular, pointed, red-tipped; stamens about 20; anthers small, yellow; styles 3 to 5. The fruit ripens in August, is globose, about 8 mm. thick, blue-black, its calyx-lobes reflexed, persistent; flesh yellow, thin and sweet; it contains 3 to 5 nutlets, commonly 5, 3.5 to 4 mm. long, the nest of nutlets 5 to 5.5 mm. thick; nutlets ear-shaped, slightly ridged on the back, with a calyx-scar, inner surface roughened with shallow pits.

THE PLUM FAMILY

AMYGDALACEÆ Reichenbach



HIS family comprises about 6 genera, including over 100 species of trees and shrubs, which are widely distributed throughout the world, but are most abundant in the north temperate zone.

Their bark, leaves, and seed, when crushed in contact with water, develop hydrocyanic acid. They also exude a gum when wounded, and most all of them produce edible fruits and are very ornamental in flower.

The leaves are alternate, simple, firm and often leathery, sometimes persistent, usually toothed, stalked and stipulate, the teeth and leaf-stalks often glandular, the stipules deciduous. The flowers are regular, usually perfect, in cymes, umbels, corymbs, or racemes; the 5-lobed calyx is inferior, free from the ovary, and deciduous; the corolla consists of 5 petals inserted on the disk or calyx-tube; the many stamens are inserted with the petals, their anthers 2-celled; pistils in our genera are solitary, some exotic genera have 1 to 3; ovary 1-celled, containing 2 ovules; style simple; stigma small, usually terminal. The fruit is a drupe, with a solitary, suspended seed; endosperm none; the embryo has fleshy cotyledons.

Fossil leaves and pits found in the Tertiary formations of Europe and North America have been described and classified as belonging to plants of this family.

Our arborescent genera are:

Drupe fleshy.

Style lateral; stone 5- or 6-ridged and reticulated; drupe smooth.

1. *Chrysobalanus*.

Style terminal.

Stone coarsely wrinkled and pitted; drupe velvety.

2. *Amygdalus*.

Stone smooth or nearly so; drupe smooth.

Flowers corymbose, appearing before or with the leaves, on branchlets of the previous year.

3. *Prunus*.

Flowers racemose, appearing after the leaves, on branchlets of the year.

4. *Padus*.

Drupe nearly dry; flowers in axillary racemes; leaves persistent.

5. *Laurocerasus*.

I. COCOA PLUM

GENUS *CHRYSOBALANUS* LINNÆUS

Species *Chrysobalanus Icaco* Linnæus



ALSO called the Gopher plum, this occurs along the coast in peninsular Florida, the West Indies and Mexico to Central America, reaching, in its greatest development, a height of 9 meters, with a trunk diameter of 3 dm., but it is usually a shrub. It is the type species of the genus.

The trunk is straight, with thin, scaly bark about 4 mm. thick, and light

brownish gray; the twigs are nearly smooth, dark red-brown, soon becoming scarred by numerous conspicuous light yellowish lenticels. The leaves are persistent, alternate, broadly elliptic to nearly orbicular, 5 to 7 cm. long, rounded, blunt-pointed or notched at the apex, contracted at the base into a very short, stout stalk, entire, leathery, dark green and shining above, yellowish green with prominent midrib beneath; the small, sharp-pointed stipules fall off early. The flowers are in cymes 2.5 to 5 cm. long, borne in the axils of the leaves expanding in spring and summer; peduncles short, stout, subtended by deciduous bracts and bractlets; the bell-shaped calyx is densely hairy, its lobes triangular-ovate, sharp-pointed, one half the length of the 5 spatulate, whitish petals; the stamens are about as long as the petals, their filaments slender, distinct; the ovoid anthers are 2-celled, opening lengthwise; the sessile ovary is thickly



FIG. 442. — Cocoa Plum.

hairy, the style filiform, arising from the base of the ovary, and terminated by a small truncate stigma; the 2 ovules are ascending. The fruit is globose, or usually slightly ovoid, 2 to 4 cm. in diameter, smooth, and variable as to color, pink to creamy white or purple; the white flesh is sweet and juicy, often 8 mm. thick, and adherent to the stone, which is pointed at both ends, prominently ridged, deeply reticulated on the surface, thin walled, 1 to 4 cm. long.

The wood is hard, strong, close-grained, light brown, with a specific gravity about 0.77; it is of no importance economically. The fruit is of the shape and size of a plum, insipidly sweet, but very variable as to size, color, and taste. It is used for preserves in Cuba under the name Hicaco. The seeds are edible, and an oil is expressed from them in some of the West Indian islands. The leaves, bark and root are astringent and are sometimes employed in tropical America as remedial agents.

A closely related shrub or small tree, *Chrysobalanus pellocarpus* Meyer, which inhabits the same geographical area, has smaller, often obovoid purple fruit with a narrow pit, and usually pointed leaves; it may be specifically distinct.

The name, *Chrysobalanus*, is Greek and signifies golden date. One other species, *C. oblongifolius* Michaux, is a shrubby plant, native in the coastal regions of the southeastern United States; another occurs on the coast of Africa.

II. PEACH

GENUS **AMYGDALUS** LINNÆUSSpecies **Amygdalus Persica** Linnaeus

THIS well-known fruit tree has become naturalized throughout the greater portion of the southern States, and is abundantly spontaneous in waste places and on roadsides in the middle and northern States. It is a broad-headed, low tree, attaining a height of about 7 meters, with a trunk diameter of 2 dm.

The bark of old trees is rough, scaly and dark brown; the twigs are round, smooth, glossy green, changing to purplish and finally gray. The leaves are alternate, simple, elliptic to lanceolate or oblong, 8 to 10 cm. long, tapering toward each end, sometimes blunt at the base, sharply toothed, light green and shining above, paler beneath; the stout leaf-stalk is 5 to 10 mm. long. The flowers develop from scaly buds formed the previous season at the axils of the leaves, expand before the leaves, are few or many, usually pink and very fragrant; the calyx-tube is urn-shaped, its 5 lobes obovate, usually purplish; the 5 petals are spreading, 8 to 20 mm. long, rounded at the apex; stamens 20 to 30, the filaments slender and distinct, usually colored; the ovary is sessile, 1-celled, and surmounted by a simple style terminated by a small stigma. The fruit is a soft, velvety drupe, subglobular, with a groove on one side, 4 to 10 cm. in diameter; the sweetish, acidulous, aromatic flesh is adherent to or free from the hard, long stone, which is elliptic or ovoid, somewhat compressed, pointed, deeply wrinkled and pitted externally, polished within; the seed is almond-like, aromatic, and slightly bitter.



FIG. 443.—Peach.

The peach is a native of Asia. Long cultivation has developed numerous varieties as to size and shape of the fruit, color and taste of the flesh, and its freedom from the stone, as well as to time of ripening. Ornamental forms, with insignificant fruit or none, are planted on account of their double, rose-like flowers or colored foliage.

The wood is rather soft, coarse-grained, and light brown. In India it is a favorite building material. The foliage and seed develop considerable hydrocyanic acid; the seeds are used in the manufacture of a substitute for oil of bitter almonds; a bland, fixed oil is also expressed from them.

Amygdalus is supposed to have been the Syrian name of the Almond, which,

with the Nectarine and two or three other Asiatic shrubs, constitute the genus, of which the Peach is the type.

III. THE PLUMS AND CHERRIES

GENUS **PRUNUS** [TOURNEFORT] LINNÆUS



PRUNUS comprises about 65 species of trees or shrubs, well distributed over the northern hemisphere. They are especially numerous in North America.

The leaves and bark abound in a bitter and astringent principle, and most all of them produce hydrocyanic acid upon maceration of the bark, leaves, or seed, with water. The fruit of most of them is edible, many being cultivated from time immemorial and now known in a great number of highly improved forms.

The leaves are alternate, simple, usually saw-toothed, stalked and deciduous, their stipules quite large, usually glandular and deciduous, the enlarged bud scales conspicuous before falling; the flowers, solitary, umbellate, or corymbose, appear with or before the leaves mostly on branchlets of the previous season; the calyx-tube is obconic, urn-shaped or tubular, 5-lobed and deciduous; the 5 petals are white to rose-colored, inserted in the mouth of the calyx-tube on a marginal disk, deciduous, rarely wanting; the 15 to 20 stamens are usually borne with the petals in three series; the filaments are thread-like, the anthers oval, 2-celled, and open lengthwise; the 1-celled ovary is borne in the bottom of the calyx-tube; the terminal style is capped by a broad, simple stigma; the 2 ovules are pendulous. The drupe is smooth, sometimes glaucous; stone bony, smooth or nearly so, more or less compressed, indehiscent; seed 1, rarely 2; cotyledons fleshy.

The generic name, *Prunus*, is the ancient Latin name of the Plum, *Prunus domestica* Linnæus, the type species. There are probably 25 shrubby species, as well as the following arborescent ones, in our area:

1. Plums; fruit usually with a ventral groove and a flattened stone (stone in No. 1 nearly globular, little flattened).
 - Umbels several-flowered; native trees.
 - Drupe purple, with a bloom (variously colored in No. 2), less than 15 mm. thick.
 - Drupe globose; stone nearly globular; leaves glabrous; southern tree. 1. *P. umbellata*.
 - Drupe oblong or oval; stone longer than thick; leaves pubescent.
 - Twigs glabrous.
 - Stone rounded at base; Arkansas, Louisiana, and Texas tree. 2. *P. tarda*.
 - Stone pointed at base.
 - Leaves hairy all over beneath; southeastern tree. 3. *P. mitis*.
 - Leaves hairy only on the midrib beneath; Pennsylvania tree. 4. *P. alleghaniensis*.
 - Twigs closely pubescent; leaves hairy, beneath; southern tree. 5. *P. injucunda*.
 - Drupe red or orange, without bloom; mostly over 20 mm. thick.
 - Calyx-lobes entire.

- Calyx-lobes without glands, not ciliate.
 Leaves acute to acuminate; eastern tree.
 Leaves obtuse; Oregon and California tree.
 Calyx-lobes glandular-ciliate or ciliate.
 Calyx-lobes serrate and glandular.
 Calyx-lobes pubescent on both sides.
 Calyx-lobes pubescent on inner side only.
- Umbels only 1- to 3 flowered; introduced European trees.
 Flowers usually solitary; twigs spiny; leaves oblong to ovate.
 Flowers usually in pairs; twigs mostly not spiny; leaves ovate to obovate.
2. Cherries; fruit without ventral groove; stone globose or subglobose.
 Flowers in lateral umbels, corymbs or fascicles, appearing with or before the leaves.
 Flowers umbellate or fascicled, not corymbose; introduced European trees.
 Leaves glabrous; pedicels short; fruit sour.
 Leaves pubescent at least on the veins; pedicels long; fruit sweet.
 Flowers corymbose, but the axis of the corymb often short; native trees.
 Leaves acute to acuminate; eastern tree.
 Leaves obtuse or rarely acute; western trees.
 Leaves glabrous.
 Leaves pubescent.
- Flowers in terminal corymbs at the ends of twigs of the season; introduced European tree.
6. *P. americana*.
 7. *P. subcordata*.
 8. *P. angustifolia*.
 9. *P. hortulana*.
 10. *P. nigra*.
 11. *P. spinosa*.
 12. *P. domestica*.
 13. *P. Cerasus*.
 14. *P. Avium*.
 15. *P. pennsylvanica*.
 16. *P. emarginata*.
 17. *P. prunifolia*.
 18. *P. Mahaleb*.

I. BLACK SLOE — *Prunus umbellata* Elliott

Also called Southern sloe, Hog, Prairie, Oldfield, Chicasaw, or Bullace plum, this is a small tree, frequent in river swamps and in hammocks of the coastal region, from South Carolina to Louisiana, north to Arkansas. Its maximum height is 6 meters, with a trunk diameter of 3 dm.

The trunk is slender, usually erect, but often ascending, with wide-spreading branches; the bark is about 8 mm. thick, separating into persistent, dark brown scales; the twigs are more or less densely hairy, soon becoming smooth and shining, light red, changing to dark brown. The winter buds are very small. The leaves are rather thin, oblong, elliptic or nearly oval, 5 to 7 cm. long,



FIG. 444. — Black Sloe.

broadest either above or below the middle, pointed or tapering at the apex, rounded or narrowed, with 2 glands at the base, margined by small pointed teeth, dark green and smooth above, paler, smooth or slightly hairy on the yellowish midrib beneath; the leaf-stalk is short and slender. The flowers, appearing before the leaves, from February to April, are 1.5 cm. across, in lateral, nearly stalkless, 3- or 4-flowered umbels, on smooth, slender stalks 1.5 to 2 cm. long; the calyx-tube is broadly obconic, its lobes sharp, triangular-ovate, hairy on the inner surface; the petals are nearly orbicular; the filaments and pistil are smooth. The fruit ripens from June to September, is globose, 1.2 to 1.5 cm. in diameter, black, with a light-colored bloom; the skin is thick and tough, the flesh thick and sour; the stone is nearly globular, plump, acute at both ends, slightly wrinkled, prominently ridged on one edge and slightly furrowed at the other.

The fruit of the Black sloe is largely gathered from wild trees for sale in the markets of the south, and is made into pies, jams, and jellies.

The wood is hard, close-grained and dark red-brown; its specific gravity is about 0.82.

2. TEXAN SLOE — *Prunus tarda* Sargent

This small tree of open woods and thickets in Arkansas, Louisiana and Texas reaches a maximum height of 8 meters, with a trunk diameter of 6 dm.

The branches are widely spreading; the bark is 1.5 to 2 cm. thick, shallowly fissured and broken into small scaly ridges of a light red-brown color; the slender



FIG. 445. — Texan Sloe.

twigs are hairy and green at first, soon becoming reddish brown and glossy, and finally red-brown and dull; the winter buds are small, narrow and sharp-pointed. The leaves are firm, oblong to obovate, 3.5 to 8 cm. long, sharp or taper-pointed, gradually narrowed, rounded or wedge-shaped at the base, finely toothed, with glandular tipped teeth, yellowish green and smooth above, more or less hairy along the yellowish midrib and principal veins beneath; the leaf-stalk is densely hairy. The flowers open in early spring, are 2 cm. across, in stemless umbels of 2 or 3 flowers, on slender, smooth pedicels about 2 cm. long; the calyx-tube is obconic, its lobes entire, acute, and hairy on both surfaces; the petals are oblong, clawed, rounded

and erose at the apex; the filaments and pistil are smooth. The fruit ripens in the late autumn, is broadly oblong to subglobose, 10 to 12 mm. long, varying in color from yellow, red, and blue to purple and black; skin thick and tough, flesh thick, rather sour; the stone is ovoid, slightly flattened, much wrinkled and sharply

pointed, rounded at the base, slightly ridged on one edge and grooved at the other.

The fruit is gathered from wild trees and made into pies and preserves.

3. GEORGIA SLOE — *Prunus mitis* Beadle

A small tree or shrub, with spreading or ascending branches, known only from dry soils in Georgia and Alabama, where it attains a maximum height of 8 meters and a trunk diameter of 3 dm.

The bark is dark gray to reddish brown; the twigs are smooth, shining, becoming dark gray or brown, seldom producing spiny spurs. The leaves are thin, elliptic, lanceolate to obovate, 2 to 9 cm. long, sharply or taper-pointed, narrowed or rounded and 2-glandular at the base, densely hairy on both surfaces, especially so on the prominent venation, bright green above, paler beneath, the leaf-stalk densely hairy, 4 to 10 mm. long. The flowers, appearing before the leaves in late March, are about 1.5 cm. across, in stalkless, 2- to 6-flowered umbels, on slender, smooth pedicels 1 to 2 cm. long; the calyx-tube is obconic, smooth at the base, its lobes triangular, blunt-pointed, hairy on outer, velvety on inner surface; the petals are obovate, rounded at the apex. The fruit, ripening in June and July, is oblong, 1 to 1.4 cm. long, dark purple, with a bloom; the stone is ovoid or oval, slightly flattened, about 1 cm. long, pointed at each end, especially at the apex, and ridged on one edge.



FIG. 446. — Georgia Sloe.

4. ALLEGHANY SLOE — *Prunus alleghaniensis* Porter

Also called Porter's plum, and sometimes, Sloe, this is a local tree or shrub, being known mainly from a narrow strip of territory crossing the mountains of Pennsylvania, known as the Barrens, extending through Huntingdon and Clearfield counties, where it forms extensive thickets and reaches a maximum height of 6 meters, with a trunk diameter of 2 dm.

As a tree it is slender, with many erect, stiff branches, and few spines if any; the bark is 8 mm. thick, fissured, and with small, persistent scales; the twigs are pale-hairy, soon becoming smooth, dark red and somewhat shining, finally very dark brown. The leaves are thick and firm, oblong-elliptic to lanceolate, 5 to 9 cm. long, sharply or taper-pointed, more or less rounded at the base, finely sharp-toothed, hairy when young, becoming dark green and roughish above, smooth except for a few hairs on the veins beneath; the leaf-stalk is slender, grooved, 1.5 to 2 cm. long, and sometimes hairy. The flowers, opening in May, when the leaves

are unfolding, are about 1.5 cm. across, in nearly stalkless, 2- to 5-flowered umbels, on slender, smooth pedicels about 2 cm. long; the calyx-tube is narrowly obconic, its lobes broadly oblong, blunt, and hairy within; the petals are rounded, white, fading to pink; the filaments and pistil are smooth. The fruit, ripening in July or August, is globose-ovoid, 1 to 2 cm. in diameter, dark purple, with a bluish bloom; the skin is thick and tough; the flesh is thick and pleasantly acid; the stone is broadly oval, somewhat flattened, 8 to 15 mm. long, pointed at both ends, ridged on one edge and somewhat grooved at the other.



FIG. 447. — Alleghany Sloe.

The fruit of the Alleghany sloe is much gathered for local use, in the making of pies and jellies. The wood is hard, close-grained, reddish brown, its specific gravity about 0.70.

5. HOG PLUM — *Prunus injuncunda* Small

Like its relatives, this is also called Sloe. It is a shrub or small, straggling, somewhat spiny tree of the granite hills of Georgia and Alabama, and is particularly abundant at the base of Stone Mountain, where it was first discovered. Its maximum height is 8 meters, with a trunk diameter of 2 dm.

The bark is thin, closely fissured, dull dark-gray to nearly black; the twigs are velvety, soon becoming reddish or purplish, and finally dull gray. The leaves are thick and firm, ovate to obovate, 3 to 6 cm. long, sharp or taper-pointed, tapering or rounded at the base, finely toothed with sharp, thin-pointed teeth, yellowish green, wrinkled and slightly hairy above, densely velvety, with the yellow midrib very prominent, the lateral veins less so, beneath; leaf-stalk stout, 0.5 to 1 cm. long, and hairy. The flowers, opening in March or April, are in nearly stalkless umbels of 4 or 5, on slender, hairy pedicels about 1.5 cm. long; the calyx-tube is obconic and hairy, its lobes triangular, erect, entire, ciliate, and sharply pointed; the clawed



FIG. 448. — Hog Plum.

petals are orbicular; the filaments and base of the pistil are hairy. The fruit, ripening in July or August, is oblong, 1.2 to 1.5 cm. long, dark purple with a lighter bloom; the flesh is thin, sour, and astringent; the stone is ovoid, 8 to 10 mm. long, much flattened, somewhat wrinkled, pointed at both ends, with a broad grooved ridge on one edge and a groove at the other.

The fruit of the Hog plum, as its common name implies, is not considered fit for domestic use. This species has been regarded as a variety of the Black sloe and described under the name *Prunus umbellata injucunda* Sargent.

6. WILD YELLOW PLUM — *Prunus americana* Marshall

Also called Wild red plum, this low-branched, somewhat spiny tree of woods and thickets from New York to Ohio, Montana, Florida, Texas and Colorado, attains a maximum height of 11 meters, with a trunk diameter of 3 dm.

The numerous branches are wide-spreading, often drooping, and frequently armed with many spine-like spurs; the bark is about 15 mm. thick, breaking up into thin, dark brown plates; the twigs are smooth or hairy, light green, becoming brown and finally reddish brown; the winter buds are very small, sharp-pointed and brown. The leaves are firm, elliptic to oval or obovate, 4 to 10 cm. long, taper-pointed, usually rounded at the base, sharply toothed, sometimes doubly so, dark green and rough with midrib impressed above, paler and hairy, especially near the veins, beneath; the slender leaf-stalk is 1.5 to 2 cm. long. The flowers appear in March at the South to May at the North; they are white, 2.5 cm. across, in sessile 2- to 5-flowered umbels, on slender, smooth pedicels 1 to 2 cm. long; the calyx-tube is obconic, smooth, usually red on the outside, the lobes entire and sharp-pointed; the petals are obovate, rounded, and irregularly eroded. The fruit, ripening from June to October, is subglobose or globose-oblong, 1.8 to 2.5 cm. long, orange to bright red, usually without bloom; the skin is thick and tough, the flesh yellow, juicy and acidulous; the stone is oval, flattened, slightly wrinkled, pointed at the top, narrowed at the base, flattened on one edge and grooved at the other.

The fruit is largely gathered from wild growing trees and used for preserves and jellies. It has also been cultivated for a long time and many selected varieties are now known to orchardists. As an ornamental tree it is much admired for its profusion of flowers, its fine form, and foliage. The wood is hard, strong, close-grained, reddish brown and lustrous; its specific gravity is about 0.73.



FIG. 449. — Wild Yellow Plum.

The Woolly-leaf plum is a variety of this, or perhaps a distinct species, with conspicuously hairy leaves and twigs, occurring west of the Alleghany Mountains, principally in the Gulf States, and known as *Prunus americana lanata* Sudworth.

7. PACIFIC PLUM—*Prunus subcordata* Benth

A low branching tree, or usually a shrub, on dry rocky hills of southern Oregon to middle California, reaching a maximum height of 7.5 meters, with a trunk diameter of 3 dm.



FIG. 450. — Pacific Plum.

The branches are stout, somewhat spreading; the bark is about 8 mm. thick, gray to brown and fissured into thin, scaly plates; the twigs are sometimes hairy, soon becoming smooth and bright red, finally dark reddish purple to brown-gray. The leaves are somewhat leathery, ovate to orbicular, 2.5 to 7 cm. long, rounded or blunt at the apex, slightly heart-shaped or rounded at the base, closely, sometimes doubly toothed, dark green above, paler beneath, the venation prominent beneath and impressed above; the leaf-stalks are 1 to 5 cm. long. The flowers, appearing from March

to May, are about 2 cm. across, in nearly stalkless, 2- to 4-flowered umbels, on slender pedicels 7 to 15 mm. long; the calyx-tube is bell-shaped, nearly smooth, the lobes oblong, rounded and somewhat hairy; the petals are obovate, rounded; the pistil and filaments are smooth. The fruit ripens in August or September, is globose or oblong, 2 to 3 cm. long, dark red or sometimes yellow; the flesh is juicy and pleasantly acidulous; the stone is somewhat flattened, 1.5 to 2.5 cm. long, pointed at each end, sharply ridged on one edge and grooved on the other.

Its fruit is much gathered from wild growing trees and from selected forms brought under cultivation. The young plants are used by western nurserymen as stock upon which to graft or bud better varieties of plums. The wood is hard, close-grained, and pinkish brown, its specific gravity about 0.64.

The Sisson or Sierra plum, a variety of this with nearly smooth, orbicular, not heart-shaped leaves, ash-colored stems, and larger yellowish fruit, is *Prunus subcordata Kelloggii* Lemmon.

8. CHICKASAW PLUM — *Prunus angustifolia* Marshall

Also called Mountain cherry, this is a somewhat spiny, small tree or shrub, with spreading branches, often forming dense thickets in dry sandy soils, from New Jersey to Florida, westward to the lower Mississippi valley, Arkansas and

eastern Texas. Its maximum height is 8 meters, with a trunk diameter of 2 dm.

The bark is thin, scarcely fissured, but broken into thick, persistent, dark brownish red scales; the twigs are nearly smooth or short-hairy, becoming entirely smooth, red or purple and shining, finally dull and dark. The leaves are rather thin, lanceolate to oblong-lanceolate, 3 to 10 cm. long, sharp or somewhat taper-pointed, more or less rounded at the base, margined by very small gland-tipped teeth, smooth and shining above, paler and dull beneath; the slender leaf-stalk is 1 to 1.5 cm. long, bearing two glands near the base of the blade. The flowers appear in March and April before the leaves, in nearly stemless, 2- to 4-flowered umbels, on slender, smooth pedicels 8 to 15 mm. long; the calyx-tube is bell-shaped, smooth, the lobes oblong, blunt-pointed, and fringed with glandular hairs; petals clawed, white, obovate, rounded; filaments and pistil smooth. The fruit, which ripens in June or July, is oval to globose, about 1.5 cm. in diameter, bright red, somewhat shining, with a slight bloom; flesh subacid and juicy; stone ovoid, swollen, somewhat ridged on one edge, conspicuously grooved at the other.



FIG. 451. — Chickasaw Plum.

The fruit of the Chickasaw plum is gathered from wild trees and sold in the markets of the southern States; the tree is also cultivated. Nurserymen catalogue about a dozen named varieties of it. The wood is rather soft, weak, light brown; its specific gravity is about 0.68.

9. WILD GOOSE PLUM — *Prunus hortulana* Bailey

Also called Garden wild plum, this grows in woods and thickets along streams, from Maryland to Kansas, Alabama and Texas. It is a small, low-branched tree, sometimes a shrub. Its maximum height is about 9 meters, with a trunk diameter of 3 dm.

The outspreading branches are without spines; the very thin bark is dark brown, usually peeling off in thin plates; the twigs are stout, stiff, smooth and red-brown, becoming darker with age. The leaves are firm and thick, ovate, lanceolate or oval, 10 to 15 cm. long, taper-pointed, wedge-shaped or rounded at the base, glandular-toothed, dark green and shining, with broad, impressed midrib above, paler and hairy along the prominent yellowish midrib beneath; the leaf-stalk is glandular near the blade, about 2.5 cm. long. The flowers, appearing with the leaves in April and May, are 1.5 to 2 cm. across, in nearly stalkless 2- to

4-flowered umbels on slender, roughish pedicels; the calyx-tube is obconic, the lobes ovate, blunt or pointed, glandular-toothed, hairy on both surfaces; the petals are obovate, seldom notched. The fruit ripens in September or October, is nearly globular, 2 to 2.5 cm. long, bright red; its skin is thick, the flesh thin, hard, and acid; the stone is oval, somewhat swollen, usually rough and pitted, grooved on one edge, ridged on the other.



FIG. 452. — Wild Goose Plum.

The fruit of the Wild goose plum is gathered from the wild trees and used like that from other wild plums. It is the parent of many of the best varieties of American cultivated plums. The wood is similar to that of the closely related plum trees.

A form with dull, thicker, coarser toothed, mostly oblanceolate, prominently-veined leaves and a smooth stone, occurring in Illinois, Missouri, and Tennessee, is known as *Prunus hortulana Mineri* Bailey, and sometimes regarded as a distinct species.

10. CANADA PLUM — *Prunus nigra* Aiton

Also called Horse plum, this is a small, bushy tree, occurring in woods and neglected lands from Newfoundland to Alberta, and southward to Georgia, reaching a maximum height of 10 meters, with a trunk diameter of 3 dm.

The bark is 3 mm. thick, with a smooth light gray to brown, thin outer layer, which peels off readily; the twigs are light green, smooth or slightly hairy, soon becoming dark red-brown, and develop spine-like spurs often 5 cm. long; the winter buds are rather large, 5 to 8 mm. long, and covered with brown scales. The leaves are firm, elliptic to obovate, 6 to 12 cm. long, 2.5 to 7 cm. broad, sharply pointed, rounded or blunt at the broadish base, margined by glandular, mostly double teeth, light green and smooth above, pale and sparingly hairy, with midrib prominent beneath; the leaf-stalk is 1.5 to 2.5 cm. long, with two prominent red glands near the base of the blade. The flowers,

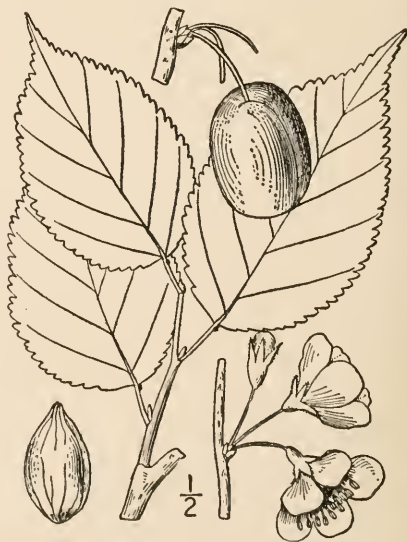


FIG. 453. — Canada Plum.

appearing before the leaves in April or May, are 1.5 to 2.5 cm. across, in 3- to 5-flowered umbels on smooth, red pedicels 1 to 2 cm. long; the calyx-tube is obconic, usually red, the lobes lanceolate, glandular-toothed, hairy on the inner surface; the petals are obovate, rounded and irregularly crose, white, fading to pink. The fruit, ripening in August or September, is oval or subglobose, 2.5 to 3 cm. long, orange to red, with a slight bloom. The skin is thick, the flesh yellow and sour; the stone is oval, flattened, sharply ridged on one edge and slightly grooved at the other.

The fruit of the Canada plum is collected for culinary purposes, and several improved forms of it are in cultivation. As an ornamental tree it is very desirable on account of its early, large fragrant flowers. The wood is strong, close-grained, hard and brown; its specific gravity is about 0.69.

II. SLOE—*Prunus spinosa* Linnæus

Also called Blackthorn and Buckthorn, this is a spiny, much branched small tree or shrub, native of Europe, but naturalized along roadsides, from Massachusetts to Pennsylvania, and New Jersey. Its maximum height is about 9 meters, with a trunk diameter of 6.5 dm.

The bark is quite smooth and nearly black; the twigs are smooth, shining, dark brown, becoming dark gray. The leaves are firm, ovate or oblong, 4 to 5 cm. long, blunt at the apex, narrowed or rounded at the base, toothed on the margin, dark green and almost smooth when fully grown; the leaf-stalk is about 1 cm. long. The flowers appear in April and May before the leaves; they are 10 to 12 mm. across, solitary or two together, on slender, smooth pedicels about 1 cm. long; the calyx-tube is bell-shaped, its lobes narrow, long and blunt. The fruit, ripening in July, is ovoid to globose, about 12 mm. in diameter, nearly black, with a bloom; flesh thin, rather acid and astringent, edible after frost; the stone is broadly oval, slightly flattened, much wrinkled, acute on one edge, ridged and grooved on the other.



FIG. 454. — Sloe.

The wood is hard, close-grained and red-brown; its specific gravity is about 0.83. It is used in Europe for the manufacture of furniture. The young trunks and straight branches are made into the celebrated Blackthorn canes. As an ornamental tree it has been extensively planted for hedges, but has been discarded, as it suckers too profusely from the roots. A double-flowering form is very handsome and greatly admired.

12. GARDEN PLUM — *Prunus domestica* Linnaeus*Prunus insititia* Linnaeus

The European garden plum, also known as the Damson plum or Bullace, is an occasional escape to roadsides and about old orchards, often forming dense thickets; it sometimes attains a height of 8 meters. The branches are stiff and upright, with or without thorns.



FIG. 455. — Garden Plum.

The twigs are rather stout, somewhat hairy at first, becoming smooth and red to grayish brown. The leaves are thick and firm, very variable in outline, from ovate to obovate, 5 to 8 cm. long, sharp or taper-pointed, more or less tapering at the base into the stout, broad, channelled leaf-stalk, coarsely and irregularly toothed, dull dark green and somewhat wrinkled above, paler, rough, and prominently veined beneath. The flowers are white, appearing in April or May, with the leaves; they are usually solitary, sometimes 2 or 3 in a cluster, on slender stalks about 5 cm. long. The fruit, which ripens in August, varies somewhat, but on wild plants is usually about 2.5 cm. long, blue-black, with a bloom; the stone is large, slightly roughened, prominently ridged and grooved on one edge.

The wood is hard, close-grained, red-brown, sometimes with lighter streaks; its specific gravity is about 0.83. It takes a fine polish and is a favorite, in Europe, for cabinet work and instrument making.

13. SOUR CHERRY — *Prunus Cerasus* Linnaeus

A native of Europe, also called Egriot, widely cultivated in many improved fruiting varieties, and a frequent escape, from suckers at the roots or spontaneously by seed, in waste places along roadsides and margins



FIG. 456. — Sour Cherry.



FIG. 457. — Sour Cherry, Carnot, Pa.

of woods, from New Hampshire to Georgia and Colorado. Its maximum height is 15 meters, with a trunk diameter of nearly 1 meter.

The trunk is short, the branches slender, outspreading and more or less drooping at the ends, forming a broad rounded head; the bark is 6 to 8 mm. thick, quite smooth, with a few elliptic lenticels, gray-brown; the twigs are slender, smooth, red or gray-brown. The leaves are thin, ovate or ovate-lanceolate, 4 to 11 cm. long, abruptly sharp or taper-pointed, rounded at the base, variously toothed, resinous when young, becoming smooth on both surfaces. The flowers, appearing

before or with the leaves in April or May, are 1.5 to 2.5 cm. across, in lateral, very scaly, short-stalked 2-to 5-flowered umbels, on smooth slender pedicels 2 to 4 cm. long; the calyx-tube is urn-shaped, smooth, its lobes rather broad, blunt, minutely glandular-toothed and reflexed; the petals are broadly obovate, notched at the apex. The fruit ripens in June and July, is nearly globular, 8 to 12 mm. in diameter, red to black, without bloom; the flesh is juicy and acid, separating readily from skin and stone.

The fruit of the Sour cherry, as found growing wild, is usually too small and sour to be much used; that of its cultivated forms, however, is well known and highly valued for its agreeably acidulous taste and flavor. The wood is strong, rather soft, close-grained and yellowish red; its specific gravity is about 0.87. It is used like that of the Sweet cherry, from which it is not differentiated by wood workers.

14. SWEET CHERRY — *Prunus Avium* Linnæus

Also called Bird, Crab, Wild, or Mazard cherry, this is native of Europe and has long been extensively cultivated in many improved varieties; it is frequently spontaneous, usually from seed distributed by birds, in open woods and along roadsides and neglected fence rows. Its maximum height is about 21 meters, with a trunk diameter of 1.2 meters.



FIG. 458. — Sweet Cherry.

The trunk is tall and straight, with short, stiff branches, forming an upright conic rather close-headed tree. The bark is 8 to 10 mm. thick, covered by a rather smooth, gray-brown, leathery outer layer, which is roughened or fissured transversely, its edges often rising, exposing the inner bark, which then becomes more or less deeply furrowed longitudinally. The twigs are stout, smooth, gray to red-brown. The leaves are thick, ovate, oval or somewhat obovate, 6 to 12 cm. long, abruptly short taper-pointed,

blunt or tapering at the base, irregularly saw-toothed, often doubly so, green and smooth above, paler and hairy on the veins beneath; the leaf-stalk is slender, smooth, 2 to 3 cm. long. The flowers, appearing with the leaves in April or May, are 2.5 to 3 cm. across, in lateral, sessile, 3-to 5-flowered umbels, on smooth slender pedicels 3 to 6 cm. long, the calyx-tube urn-shaped, more or less red at the top, the lobes oblong, blunt and reflexed; petals white, nearly orbicular, broadly notched at the apex. The fruit of wild trees is globular or nearly so, 8 to 10 mm. in diameter, dark red to nearly black, with a slight bloom; the flesh is sweet and adheres to the globose stone.

The fruit of the Sweet cherry in the wild state is small, its flesh thin, dry and unpalatable and of little use except as food for birds. The cultivated forms originating from this species are very numerous.

The wood is strong, rather soft, close-grained, yellowish red and takes a very fine polish; its specific gravity is about 0.88. It is largely used for fine furniture, inside finishing, and also for musical and other instruments.

15. WILD RED CHERRY — *Prunus pennsylvanica* Linnæus fil.

Also called Bird, Pigeon, or Pin cherry, this tree grows in open woods and clearings from Newfoundland to British Columbia, south to Georgia, Tennessee and Colorado. Its maximum height is about 12 meters, with a trunk diameter of 4 dm.

The bark is 1 to 1.5 mm. thick, readily peeling off in thin red-brown layers; the twigs are smooth, becoming bright red, shining, with a few yellow lenticels; the leaves are thin, oblong, lanceolate, to nearly oval, 8 to 15 cm. long, taper-pointed, tapering or rounded at the base, doubly toothed, bright green and shining above, paler beneath. The flowers, appearing with the leaves from April to June, are about 1.5 cm. across, in clusters of short-stalked, 4- or 5-flowered corymbs, on slender pedicels 1.5 to 3 cm. long; the calyx-tube is obconic and smooth, its lobes oblong, red-margined, and blunt; the petals are white, broadly obovate; the stamens and pistil are smooth. The fruit is globose, 5 to 7 mm. in diameter, bright red, smooth, the skin thick, the flesh thin and sour; stone globose or slightly elongated, slightly ridged on one edge.

The wood is soft, close-grained, light brown; its specific gravity is about 0.50.

As a natural reforestering agent this cherry is one of the most valuable in the eastern portion of the continent. Growing rapidly and thickly upon the bare soil after destructive forest fires, it forms exclusive forests in a few years, and by its short life soon makes way for other trees whose seedlings it had protected. As an ornamental tree its fine form, profusion of early bloom, and abundance of showy fruit, useful as food for birds, make it desirable; its short life, however, is against its general use for lawn or park planting.



FIG. 459. — Wild Red Cherry.

16. BITTER CHERRY — *Prunus emarginata* Walpers

This cherry occurs in the mountains from southern British Columbia to southern California, Idaho and Nevada. Its maximum height of 8 meters, with a trunk diameter of 2.5 dm., is attained only in the northern portion of its range; elsewhere it is merely a large shrub.

The branches are slender and upright. The bark is about 8 mm. thick, usually smooth and shining, dark brown or reddish, with bands of yellowish gray markings; the twigs are slender, slightly hairy, soon becoming smooth, and dark red-brown. The leaves are membranous, oblong, obovate to oblong-lanceolate, 3 to 8 cm. long, rounded and blunt at the apex, usually with two large dark glands at the narrow base, margined by small gland-tipped teeth, dark green and smooth above, paler and smooth beneath; leaf-stalk smooth, grooved and stout, about 1 cm. long. The flowers, appearing from April to July, in clustered 2- to 4-flowered umbels, are on slender



FIG. 460. — Bitter Cherry.

pedicels 2.5 to 4 cm. long; the calyx-tube is obconic, usually smooth, the lobes are broadly oblong, stout, rounded or notched; petals greenish white, obovate, rounded or notched; stamens and pistil smooth. The fruit, ripening in summer, is globose, 8 to 15 mm. in diameter, dark red to nearly black, slightly translucent, its flesh thin, astringent and bitter; stone ovoid, pointed at each end, somewhat pitted, or smooth, grooved and ridged on one edge, slightly grooved at the other, variable in size and form.

The wood is soft, close-grained, brittle and pinkish brown; its specific gravity is about 0.45; it takes a high polish and is used for furniture in the regions in which it occurs.

17. WOOLLY-LEAF CHERRY — *Prunus prunifolia* (Greene) Shafer

Cerasus mollis Douglas. *Prunus mollis* Walpers, not Torrey

Prunus emarginata villosa Sudworth. *Cerasus prunifolia* Greene

This medium-sized tree occurs from British Columbia to Idaho, southward to southern California, and Arizona, its maximum height being about 15 meters, with a trunk diameter of 5 dm., though often only a shrub.

The bark is about 8 mm. thick, usually smooth and dark gray; the twigs are slender, hairy, becoming smooth and gray-brown. The leaves are thick-membranous, oval to obovate, 4 to 9 cm. long, blunt or more or less pointed at the apex, narrowed and 2-glandular at the base, margined by gland-tipped teeth, dark green with impressed midrib above, paler and woolly beneath; leaf-stalk slender, channelled and hairy, about 1 cm. long. The flowers, appearing from May to July, are 1 to 1.5 cm. across, in several 2- to 4-flowered umbels, on slender hairy pedicels 2 to 5 cm. long; the calyx-tube is obconic, hairy, as are the blunt lobes; petals obovate, rounded at the apex; stamens and pistil smooth. The fruit, ripening in August, is globose, 8 to 12 mm. in diameter, bright red, flesh thin and very bitter, the stone ovoid.

The wood is brittle, soft, close-grained, pinkish-brown; its specific gravity is about 0.45. It is used in the manufacture of furniture.

The young plants are used by nurserymen as stock upon which to graft cultivated varieties of cherries. It is said to have been planted as a shade-tree in some of the towns of the Northwest.



FIG. 461. — Woolly-leaf Cherry.

18. MAHALEB — *Prunus Mahaleb* Linnæus



FIG. 462. — Mahaleb.

A small European tree, also called the Perfume or Scented cherry, often a shrub, flowering when very young and small; it is sparingly naturalized in our area in waste places, fence rows and waysides, from Ontario to Pennsylvania; also recently reported from Kansas. Its maximum height is 7.5 meters, with a trunk diameter of 4 dm.

The bark is thin, smooth and light gray; the twigs are slender, shining and grayish red; the leaves are thin and firm, ovate, 4 to 6 cm. long, abruptly sharp-pointed, rounded or somewhat cordate at the base, margined with small, glandular teeth, light green and smooth on

both surfaces; the leaf-stalk is slender, 1 to 2 cm. long. The flowers, which are 1 cm. across, appear with the leaves, on short, leafy branches of the current season, in several-flowered umbels; they are borne on stout pedicels; the calyx-tube is top-shaped, its lobes ovate; the petals are white, obovate, about 5 mm. long. The fruit is globose or globose-ovoid, about 8 mm. in diameter, reddish black and shining. The flesh is thin, hard and bitter, the stone small, globose, slightly flattened.

The Mahaleb is distinctly fragrant in all its parts, and consequently used in the manufacture of all sorts of ornaments, especially by the French, who also use it largely for perfumery. The favorite Weichsel smoking pipes and pipe stems, umbrella handles, small boxes, and other trinkets, are made from the stems and roots of this tree. The wood is a favorite for cabinet work; it is hard, dark brown, and takes a fine polish; its specific gravity is about 0.94.

As an ornamental tree or shrub it is highly appreciated in Europe, but is seldom seen, as such, in our area, where its introduction was due to the fact that it is a favorite of the nurserymen as a stock upon which to graft other kinds of cherries or plums.

IV. THE WILD CHERRIES

GENUS **PADUS** BORCKHAUSEN



PADUS includes about 15 species of trees or shrubs, natives of the northern hemisphere. The leaves are deciduous, alternate, simple, usually toothed and stalked, the stipules early deciduous, the accrescent bud scales very prominent. The flowers are numerous and borne in terminal racemes on young leafy branches of the season's growth, appearing after the leaves; the calyx-tube is usually bell-shaped, with 5 short lobes; petals white, inserted in the throat of the calyx; the 15 to 20 stamens distinct; style simple, terminated by the flattish stigma; ovules pendulous, 2 in number. The drupe is fleshy, small, smooth, and contains a solitary seed.

The type of the genus is the European bird cherry, *Prunus Padus* Linnæus, *Padus* being its old Greek name. By the Germans it is aptly designated Grape cherry. It is sometimes cultivated in America for its early flowering and showy black fruit, which is much eaten by birds. It has escaped from cultivation at Pittsburgh, Pennsylvania.

Our arborescent species are:

Sepals deciduous; teeth of the leaves slender; small trees or shrubs.

Fruit very astringent; leaves thin, smooth; eastern.

Fruit sweet or but little astringent; leaves thick; western.

Leaves smooth.

Leaves hairy beneath.

Sepals persistent; teeth of the leaves relatively coarse.

Smooth throughout.

Sepals deltoid, broader than long; leaves delicately reticulate veined.

Sepals ovate, longer than broad; leaves not reticulate veined.

1. *P. virginiana*.

2. *P. melanocarpa*.

3. *P. demissa*.

4. *P. eximia*.

5. *P. serotina*.

Hairy on young shoots, raceme-axis, and pedicels.

Leaves pale or glaucous beneath, at least when old, and nearly glabrous beneath, except along veins.

Leaves obovate, rounded at apex; drupe red.

6. *P. Cuthbertii*.

Leaves oblong to ovate or elliptic, obtuse to acuminate; drupe purple.

7. *P. alabamensis*.

Leaves densely brown persistent-woolly beneath, not glaucous.

8. *P. australis*.

1. CHOKE CHERRY — *Padus virginiana* (Linnæus) Rœmer

Prunus virginiana Linnæus

As a shrub this is frequent on rocky soils, usually along banks of streams, from Newfoundland to Manitoba, southward to Georgia and Texas, rarely becoming a tree, of a maximum height of about 8 meters, with a trunk diameter of 2 dm.

The bark is about 7 mm. thick, slightly fissured, dark gray and of a disagreeable odor; twigs usually smooth, becoming light brown and finally dark red-brown; the winter buds are pointed, about 4 mm. long. The leaves are thin, ovate to obovate, 5 to 10 cm. long, pointed, mostly rounded at the base, margined with sharp, slender teeth, smooth on both sides, the leaf-stalk 1 to 2 cm. long, slender, grooved, with two large glands near the base of the leaf-blade. The flowers, appearing from April to June, are about 12 mm. across, in upright or nodding loosely-flowered racemes 8 to 15 cm. long, the axis and pedicels smooth, the latter 6 to 10 mm. long, the calyx-tube urn-shaped, its lobes broad, blunt, reflexed and smooth; the petals are white, nearly orbicular, the filaments and pistil smooth; the style is short, thick, and abruptly enlarged into a broad terminal stigma. The fruit, ripening in July or August, is globose, 8 to 10 mm. in diameter, red, black, or yellow, shining; the flesh thin, juicy, dark colored and very astringent; the stone is ovoid, somewhat flattened, ridged on one edge, acute at the other.



FIG. 463. — Choke Cherry.

The fruit becomes much less astringent when fully ripe and is made into jellies and preserved, especially at the North.

The wood is hard, close-grained, weak, light brown. It is a beautiful plant at all stages of growth, but especially when in flower, and deserves a place in all large plantations.

2. ROCKY MOUNTAIN WILD CHERRY — *Padus melanocarpa* (A. Nelson) Shafer

Prunus demissa melanocarpa A. Nelson

This shrub or small tree, also called Choke cherry, is distributed from North Dakota to Alberta, Washington, California, Nebraska and New Mexico, sometimes attaining a height of about 10 meters, with a trunk diameter of 3 dm.



FIG. 464. — Rocky Mountain Wild Cherry.

The bark is thin, usually quite smooth and dull, dark gray. The slender twigs are smooth and dark, reddish brown to gray. The leaves are thick and firm, narrowly obovate or oval, abruptly sharp or blunt pointed, rounded or seldom tapering at the base, margined by short, sharp teeth, bright green, smooth and shining above, paler and smooth beneath. The leaf-stalk is stout, glandular, about 2 cm. long, usually quite red. The flowers are in dense, usually short, thick-stemmed racemes 7.5 to 10 cm. long, smooth throughout, the petals about 6 mm. long. The fruit is globose, 6 to 8 mm. in diameter, black or nearly so, rarely

yellow, the flesh thin, sweet and but little astringent; stone nearly globular.

The wood is hard, weak, close-grained and light brown.

When in flower this is very beautiful, and is frequently planted for ornament about Rocky mountain homes. Its smooth foliage and nearly black fruit seem to distinguish it from the following species. The fruit is used for food by the Indians, and is often made into jellies.

3. COLUMBIAN WILD CHERRY — *Padus demissa* (Nuttall) Røemer

Cerasus demissa Nuttall. *Prunus demissa* Walpers

This tree or shrub, also called the Western choke cherry, is abundant in the Columbia River basin of Washington, Oregon, and Idaho, extending east to South Dakota and south to California. It attains a height of 15 meters, with a trunk diameter of 6 dm.

The bark is about 6 mm. thick, slightly fissured, gray-brown. The twigs are stout, densely hairy when young, becoming gray-brown and nearly smooth. The leaves are thick and firm, obovate or oblong-obovate, 5 to 10 cm. long, broadest about the middle, sharp-pointed, rounded or heart-shaped at the base, sharply

toothed on the margin, bright green and slightly hairy above, pale and hairy beneath; the stout leaf-stalk is 1 to 2 cm. long, with 2 glands near the base of the leaf-blade, and hairy when young. The flowers are in rather dense hairy or smooth racemes 7 to 10 cm. long; the calyx is somewhat glandular, its lobes short and obtuse; petals white, orbicular, about 5 mm. long. The fruit is globose, 8 to 10 mm. in diameter, purplish or red; the flesh is thin, sweet and edible when fully ripe.

The wood is hard, close-grained, grayish brown; its specific gravity is about 0.70. It takes a fine polish, and is used for cabinet work. The bark is used in medicine like that of the Eastern wild cherry, *Padus serotina*, and the fruit used for food.



FIG. 465. — Columbian Wild Cherry.

4. TEXAS CHERRY — *Padus eximia* Small

Prunus eximia Small

A beautiful tree occurring in the river valleys of southern Texas, where it reaches a maximum height of 26 meters.

The branches are loosely spreading, forming a round-headed tree; the twigs are slender, smooth, red-brown to gray-brown. The leaves are rather thin, ovate to oblong, lanceolate or oval, 3 to 8 cm. long, blunt or somewhat bluntly taper-pointed, rounded, with 2 glands at the base, margined with appressed sharp teeth, bright green above, pale green beneath, smooth on both surfaces; the slender leaf-stalk is 1 to 1.5 cm. long. The flowers, appearing in April, are 10 to 12 mm. across, in drooping racemes 5 to 7 cm. long; the pedicels are club-shaped, smooth, 4 to 8 mm. long; the calyx-tube is obconic, the short lobes broader than long; the white petals are orbicular to ovate. The fruit ripens in



FIG. 466. — Texas Cherry.

August, is globose, purple, 8 to 10 mm. in diameter, the persistent calyx and filaments adhering to its base; flesh sweet; stone globular, pointed at the apex.

This Cherry is often eaten by children, sometimes with injurious effects.

5. WILD CHERRY — *Padus serotina* (Ehrhart) Agardh*Prunus serotina* Ehrhart

This well-known tree, also called the Black, Cabinet, or Rum cherry, is abundant in mixed forests and neglected clearings, from Nova Scotia to Ontario and South Dakota southward to Florida, Kansas and Texas, attaining a maximum height of 35 meters, and a trunk diameter of 2 m.

The bark of old trunks is nearly 2 cm. thick, fissured in all directions into small



FIG. 467. — Wild Cherry.

scaly plates of a dark red-brown color; with raised edges on young trunks and branches the bark is smooth and yellowish brown, the outer portion peeling off easily, exposing a bright green inner layer. The twigs are slender, smooth, pale green or yellowish brown, becoming bright red or brown; winter buds covered by brown, pointed scales. The leaves are firm, oval to oblong or lanceolate, 6 to 15 cm. long, taper-pointed, or rarely blunt, wedge-shaped or rounded with two prominent glands at the base, margined by short, thick-tipped glandular teeth, slightly hairy at the midrib when unfolding, soon becoming smooth, shining, dark green with impressed midrib above, paler with prominent midrib beneath, the leaf-

stalk about 1.5 cm. long. The tree flowers from April to June, when the leaves are partly expanded; flowers about 8 mm. across, on short pedicels less than 1 cm. long, in narrow, erect or spreading racemes 10 to 15 cm. long, the axis and pedicels smooth; the calyx-tube is cup-shaped, smooth, its lobes ovate, obtuse, and slightly irregularly toothed, and, with the filaments, persistent in fruit; petals white, broadly obovate; filaments and pistil smooth. The fruit ripens in August or September, is globose, 8 to 10 mm. in diameter, dark purple or black; skin thick; flesh dark, juicy, but slightly astringent; the stone is oblong, pointed, ridged on one edge, sharp on the other.

The fruit is used to some extent for making jellies and as a flavoring for alcoholic liquors. The bark is an important drug and is official in the United States Pharmacopœia on account of the tonic bitter principle and the sedative hydrocyanic acid it produces; it should be gathered in the autumn or winter.

The wood is strong, rather hard, close-grained, yellowish red and satiny; its specific gravity is about 0.58. It is used very extensively in the manufacture of furniture and for panels, doors, cases and frames. The tree is of rather rapid growth, but is not esteemed for decorative planting.

A form with very large, coarsely-toothed, leathery leaves, whitish beneath, stout diverging racemes with few flowers, their calyx-lobes and filaments hairy, is confined to the higher summits of the southern Alleghany Mountains; it is known as *Padus serotina neomontana* (Sudworth) Small.

6. CUTHBERT'S CHERRY — *Padus Cuthbertii* Small

Prunus Cuthbertii Small

Cuthbert's cherry is known only from Georgia, where it occurs in rich sandy woods, attaining a maximum height of only about 6 meters, with a trunk diameter of 1.5 dm., and is often only a shrub.

The twigs are slender, woolly, becoming dark gray to red-brown. The leaves are thick and leathery, obovate, varying to oval or fiddle-shaped, 4 to 9 cm. long, blunt or notched at the apex, wedge-shaped with two small glands at the base, margined by short teeth, dull, dark green and smooth above, pale or somewhat glaucous, conspicuously hairy on the midrib, less so on the lateral veins, beneath; the leaf-stalk is 5 to 10 mm. long and densely hairy. The flowers, appearing in May, are about 7 mm. across, in racemes 5 to 8 cm. long, the axis and pedicels densely hairy; the pedicels are club-shaped, 3 to 5 mm. long, becoming twice as long in fruit; the calyx-tube is broadly obconic, shorter than the triangular lobes, which are broader than long, and obtuse; petals crisp, nearly orbicular. The fruit, ripening in July, is globose, smooth and red, subtended by the persistent calyx and filaments; stone globose, slightly depressed, taper-pointed, and slightly ridged on both edges.



FIG. 468.—Cuthbert's Cherry.

7. ALABAMA CHERRY — *Padus alabamensis* (C. Mohr) Small

Prunus alabamensis C. Mohr

This cherry is known only from the mountainous districts of Alabama and Georgia, where it is a spreading tree with slightly drooping branches, attaining a maximum height of 10 meters, with a trunk diameter of 5 dm.

The bark is rather thick, much fissured, dark brown, splitting into thin small

scales; the twigs are slender, hairy, soon becoming nearly smooth, dark red-brown



FIG. 469. — Alabama Cherry.

and finally brown, with many small, darker, roundish lenticels. The leaves are thick and leathery, oblong-elliptic to broadly ovate, 6 to 12 cm. long, 2.5 to 4 cm. wide, short taper-pointed or sometimes blunt, rounded or slightly narrowed at the base, toothed by rather distant, short, blunt, gland-tipped teeth, deep green and smooth above, pale and slightly hairy beneath, especially along the prominent, darkish venation; the petiole is short and grooved. The flowers appear early in May, are about 7 mm. across, in stiff spreading

or erect racemes 10 to 15 cm. long, the axis, pedicels, and the calyx closely hairy; the calyx-tube is urn-shaped, its lobes short, nearly triangular; the petals are nearly orbicular, white, the filaments and pistil smooth; the stigma club-shaped. The fruit is globose, about 10 mm. thick, purple, subtended by the persistent calyx and filaments at its base; the flesh is thin and sour; the stone is ovoid, slightly flattened, about 7 mm. long, ridged on one edge, grooved at the other.

8. SOUTHERN WILD CHERRY — *Padus australis* (Beadle) Small

Prunus australis Beadle

A very local species known only from the vicinity of Evergreen, Alabama, where it is a spreading tree, attaining a maximum height of 20 meters, with a trunk diameter of 4.5 dm.

The bark of old trunks is 1 cm. thick, gray to nearly black; on younger trunks and branches it is light gray, roughened by numerous lenticels; the twigs are slender, pale-hairy, soon becoming smooth, and dull reddish brown. The leaves are thin and firm, obovate to ovate or elliptic, 4 to 10 cm. long, abruptly blunt-pointed, sometimes sharp-pointed, rounded or narrowed at the base, finely saw-toothed, dull dark green and smooth above, covered by brownish hairs

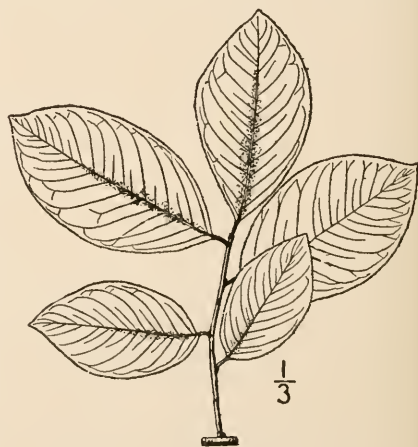


FIG. 470 — Southern Wild Cherry.

beneath, most abundant along the broad midrib and the slender lateral veins; the stout leaf-stalk is about 8 mm. long, rusty-hairy and glandular near the blade. The flowers are on short pedicels in slender, spreading racemes 7 to 10 cm. long, which are densely hairy. The fruit ripens in July, is globose, about 8 mm. in diameter, dark purple, with the persistent calyx and stamens at its base.

The wood of the Southern wild cherry is probably very similar to that of the common wild cherry.

V. THE EVERGREEN CHERRIES

GENUS **LAUROCERASUS** [TOURNEFORT] REICHENBACH



ABOUT 20 species of Evergreen cherries are known, all natives of warm-temperate and tropical regions in both the Old World and the New. Besides the four here described as occurring within the United States, two others grow in the West Indies and in Mexico and Central America. The so-called English laurel (*Laurocerasus Laurocerasus*), the type of the genus, is widely cultivated for ornament in England and France, but is a native of southeastern Europe.

The leaves are alternate, persistent on the trees into their second season, thick, shining, toothed or entire, the rather large stipules falling away early. The flowers are borne in racemes in the axils of leaves of the previous season, opening in some kinds late in the year, in others in the spring. The calyx has 5 small lobes, and there are 5 petals and 15 to 30 stamens with very slender filaments. The ovary is stalkless, containing 2 ovules, and ripens into a small stone-fruit (drupe), its pit containing one seed, the flesh nearly dry and scarcely edible. The foliage develops much prussic acid, when macerated in water.

Our species may be distinguished as follows:

Drupe oblong to oval; petals smaller than the calyx-lobes; southeastern tree. 1. *L. caroliniana*.

Drupe globose to subglobose; petals longer than the pointed calyx-lobes.

Calyx-lobes laciniate; southeastern tree.

2. *L. myrtifolia*

Calyx-lobes entire; Pacific coast trees.

Leaves spinulose-toothed.

3. *L. ilicifolia*.

Leaves entire-margined.

4. *L. Lyoni*.

1. WILD ORANGE — **Laurocerasus caroliniana** (Miller) Roemer

Padus caroliniana Miller. *Prunus caroliniana* Aiton

This beautiful evergreen tree, also called Mock orange, inhabits rich soil, preferring river valleys, from North Carolina to Florida, Mississippi, and Texas. It also occurs in Bermuda. It attains a maximum height of about 12 meters, with a trunk about 3 dm. thick.

The thin bark is gray and smooth, or somewhat ridged, the young twigs smooth, green, turning red to red-brown, the pointed buds 3 or 4 mm. long. The leaves

are oblong to oblong-lanceolate, leathery, 5 to 12 cm. long, pointed at the apex, narrowed at the base, entire-margined, or rarely with a few sharp teeth, the upper side dark green and shining, paler green and dull on the under side; the leaf-stalks are 5 to 8 mm. long. The flower-clusters are shorter than the leaves; the flower-stalks are club-shaped, 2 to 4 mm. long; the flowers open from February to April;



FIG. 471. — Wild Orange.

the obconic calyx-tube is white, the lobes small, rounded, entire-margined, reflexed; the petals are shorter than the calyx-lobes, erect, boat-shaped, about 1 mm. long; the stamens are orange-yellow and much longer than the petals. The fruits are oblong or oval, 10 to 13 mm. long, pointed, black and shining, the skin thick, the flesh thin, the pit ovoid, slightly ridged on one side.

The tree is much planted in the South for ornament and for hedges, and grows rapidly. The hard and strong wood is brown, with a specific gravity of about 0.87. Other common names are Laurel cherry, Carolina cherry, Mock olive.

2. WEST INDIAN CHERRY — *Laurocerasus myrtifolia* (Linnæus) Britton

Celastrus myrtifolius Linnæus. *Prunus sphaerocarpa* Swartz

Laurocerasus sphaerocarpa Rœmer

Widely distributed in the West Indies and in South America, this small evergreen tree occurs sparingly in southern Florida, where it grows to a height of about 12 meters, and forms a trunk sometimes 3 or 4 dm. thick.

It has thin, nearly smooth reddish brown bark, and slender orange-brown, smooth young twigs which soon turn gray; the buds are small and bluntish. The leaves are leathery, elliptic to ovate-elliptic, 5 to 10 cm. long, blunt or blunt-

pointed, narrowed or sometimes rounded at the base, entire-margined, bright green and shining on the upper side, paler and dull beneath; the leaf-stalks are about 1 cm. long. The flowers appear late in the year, the clusters shorter than the leaves; the slender flower-stalks are 4 to 15 mm. long; the calyx-lobes are very small, their margins toothed; the petals are white, broadly obovate, yellowish near the base, much longer than the calyx; the orange-colored stamens are as long as the petals or longer. The cherries are globular, 9 to 12 mm. in diameter, orange-brown, the flesh thin, the pit ridged on one side.



FIG. 472. — West Indian Cherry.

The wood is dense, hard, red, with a specific gravity of about 0.90.

3. ISLAY — *Laurocerasus ilicifolia* (Nuttall) Römer

Cerasus ilicifolia Nuttall. *Prunus ilicifolia* Walpers

Inhabiting hillsides, cañons, and river banks in California and Lower California, this fine evergreen tree attains a maximum height of about 10 meters, with a trunk sometimes 6 dm. thick at the base; it is usually much smaller, however, and often shrubby.



FIG. 473. — Islay.

The bark is quite thick, red-brown and fissured. The young twigs are smooth, yellow-green, becoming brown, the buds pointed. The leaves are ovate, thick, spiny-toothed, 6 cm. long or less, pointed or blunt at the apex, rounded, slightly heart-shaped or narrowed at the base, dark green and

shining on the upper side, the under surface yellowish green and dull; the leaf-stalks are channelled and 3 to 12 mm. long. The racemes of flowers are as long as the leaves or longer, the flowers opening from April to July; the flower-stalks are 3 to 6 mm. long; the calyx-tube is orange with small pointed reflexed lobes much shorter than the blunt obovate petals; the stamens are about as long as the petals. The cherries are nearly globular, purple, about 1.5 cm. in diameter when ripe, the flesh thin, the pit ovoid, smooth.

The wood is hard, strong, dense, with a specific gravity of about 0.98, being very nearly as heavy as water. The plant grows rapidly and is esteemed for hedges in warm-temperate regions, but is not hardy at the North. Among Californian common names for it are Holly-leaf cherry, Evergreen cherry, Spanish wild cherry.

4. ISLAND ISLAY — **Laurocerasus Lyoni** (Eastwood) Britton

Cerasus Lyoni Eastwood. *Prunus ilicifolia integrifolia* Sudworth

Prunus integrifolia Sargent, not Walpers

This tree of the islands near the coast of southern California is a near relative of the preceding species. It grows to a height of about 12 meters, with a trunk sometimes 4.5 dm. thick.



FIG. 474. — Island Islay.

Its bark is thick and gray. The young twigs are smooth, yellow-green, becoming brown. The leaves are leathery, ovate to ovate-lanceolate, 5 to 8 cm. long, sharp-pointed, entire-margined, dark green and shining on the upper side, somewhat paler and dull on the under surface, the base rounded. The flower-clusters are very dense and about as long as the leaves; the flowers are very short-stalked or nearly stalkless, opening in March or April; the calyx-lobes are much shorter than the obovate petals,

which are about as long as the stamens. The round purple fruits are 1.5 to 2 cm. in diameter.

THE MIMOSA FAMILY

MIMOSACEÆ Reichenbach



HIS family comprises some 35 genera, with about 1350 species of herbs, shrubs or trees, which are common in the warmer portions of the world, but are most abundant in the tropics, where some of them are of great economic importance, the well-known gum arabic being a gummy exudation of various species of the genus *Acacia*. Some of the most important shade trees of the tropics, also, are members of this family. The leaves of many of these plants are very sensitive, responding, by drooping, to the slightest touch, even a slight disturbance of the surrounding atmosphere being sufficient to produce this effect, as in the case of the well-known Sensitive plant, *Mimosa pudica* Linnæus, of our greenhouses, which is a common weed in the tropics.

The leaves are alternate, mostly compound or 2 to 3 times evenly pinnate, stalked and stipulate, the stipules often persistent and spine-like. The flowers are small, mostly in spikes or heads, usually perfect, sometimes polygamous; calyx 3-to 6-lobed or toothed, the lobes valvate in the bud; petals equaling the sepals in number, distinct or partly united; the stamens equal the petals in number, or are twice as many, or very numerous, usually conspicuously much longer than the corolla, their filaments distinct or united at the base; pistil a single carpel; ovary superior, 1-celled; style simple, tipped by the small stigma. The fruit is a leguminous pod, variously shaped and often contorted; the seeds are with or without endosperm; cotyledons thick and fleshy.

In addition to the trees here described about 60 species of shrubs and herbs in 8 genera occur in the United States.

Our genera, with arborescent species, are:

Stamens more than 10.

Filaments partly united into a tube.

Pod splitting into halves through the thickened margin.

Pod thick, leathery, contorted; flowers in globose heads; leaves few-foliolate.

1. *Pithecolobium*.

Pod hard, woody, straight or nearly so; flowers in spikes; leaves many-foliolate.

2. *Siderocarpus*.

Pod thin, leathery.

Flower heads small, 1.5 to 2 cm. in diameter; ovary stalked; leaflets nearly symmetrical.

3. *Havardia*.

Flower heads large, 3 to 4 cm. in diameter; ovary sessile; leaflets one-sided.

4. *Albizzia*.

Pod not splitting into halves through the margin, but breaking away from it.

5. *Lysiloma*.

Filaments distinct or the inner ones sometimes united at the base.

Ovary stalked; pod dry; seeds not in 2 distinct rows.

Ovary sessile; pod swollen, nearly cylindric, pulpy; seeds in 2 distinct rows.

Stamens only as many as the calyx-lobes or twice as many.

Pods straight, or but slightly curved, in loose clusters.

Pod flat, compact; seeds transverse, not enclosed in a sac.

Pod thick, spongy; seeds oblique, enclosed in a sac; spines above the leaf-stalk.

Pods coiled into a close spiral, in dense clusters; spines below the leaf-stalks.

6. *Acacia*.

7. *Vachellia*.

8. *Leucæna*.

9. *Prosopis*.

10. *Strombocarpa*.

I. THE CATS-CLAWS

GENUS **PITHECOLOBIUM** MARTIUS



PITHECOLOBIUM consists of about 100 species of trees or shrubs, with or without spines. The leaves are alternate, bipinnate, typically few-foliolate, usually glandular; stipules deciduous, or persistent and spinescent. The flowers are perfect or polygamous, in globose heads; the calyx is bell-shaped or tubular, 5-, or sometimes 6-toothed; the corolla consists of 5 petals, partly united; stamens very numerous, long-exserted, the filaments thread-like, united at the base into a tube; anthers small; ovary with many ovules, borne at the bottom of the calyx-tube, contracted into a slender style; stigma small, capitate; ovules in two rows. The fruit is a compressed, narrow legume, often greatly contorted, sometimes with pulpy or mealy partitions between the seeds, tardily dehiscent. The seeds are partly enclosed by the bright colored aril-like funicle, ovate to orbicular, compressed, and suspended transversely in the pod.

The genus *Pithecolobium* is widely distributed in the tropical and subtropical regions of both hemispheres, but is most abundant in tropical America. One of the best known and most valuable species is the Mexican rain tree, *Pithecolobium saman* (Jacquin) Benth, of Central America, planted and widely naturalized throughout the West Indies; it is a magnificent shade tree, and its pulpy pods, edible but insipid, are valued as food for cattle.

The name is Greek, in reference to the much contorted pods of most of the species. The type species is considered to be *P. Unguis Cati* (Linnæus) Martius. The oldest generic name for these plants is *Zygia* P. Browne, but it is unavailable for use because the author established no type species.

Our arborescent species are:

Twigs spiny; leaflets thin, 2.5 to 5 cm. long.

Twigs not spiny; leaflets leathery, 3 to 7 cm. long.

1. *P. Unguis-Cati*.

2. *P. guadalupense*.

1. CATS-CLAW — *Pithecolobium Unguis-Cati* (Linnæus) Martius*Mimosa Unguis-Cati* Linnæus. *Zygia Unguis-Cati* Sudworth

This small tree or straggling shrub inhabits sandy soils of southern peninsular Florida and the Keys, and occurs southward throughout the West Indies into tropical America; its maximum height is 8 meters, with a trunk diameter of 2 dm.; it is also called Long pod and Florida cats-claw.

The branches are irregular and spiny, forming a flat-topped tree. The bark is about 6 mm. thick, shallowly fissured into reddish brown plates. The twigs are slender, angular at first, usually zigzag, brown to dark brown, the straight, stiff stipular spines 15 mm. long or less. The leaves are persistent, evenly bipinnate; the slender leaf-stalk is 3 to 4 cm. long, slightly grooved, with a large orbicular gland at the end; there is only one pair of 2-foliolate pinne on slender, glandular stalks 6 to 12 mm. long; the leaflets are membranous, obliquely obovate or oval, 2 to 4 cm. long, rounded or short-pointed, broadly wedge-shaped at the base, entire or slightly wavy on the margin, light green and shining above, paler beneath. The flowers appear from March to September, in slender terminal or axillary panicles of globose heads about 2 cm. in diameter; calyx bell-shaped, 5-lobed, about 2 mm. long and about one fourth the length of the smooth, sharp-pointed petals; the numerous purplish stamens are twice as long as the corolla, their filaments united into a tube for half their length; ovary stalked; style filiform. The fruit is compressed, 8 to 12 cm. long, 6 to 12 mm. wide, much twisted and contorted, thick, leathery, long-stalked, rounded at the apex, thickened at the margins, light red-brown, at length splitting through the thickened margins; the seeds are irregularly obovate, somewhat compressed, 10 mm. long, dark brown and shining and partly surrounded by the enlarged bright red ariloid fleshy stalk.

The wood is very hard, close-grained, bright red to purple, with bright yellow sapwood; its specific gravity is about 0.90. The somewhat astringent bark has a local reputation as a remedy for urinary disorders, on which account it is sometimes called the Nephritic tree.



FIG. 475. — Cats-claw.

2. BLACK BEAD — *Pithecolobium guadalupense* Chapman

FIG. 476. — Black Bead.

A small unarmed tree or shrub growing in sandy or rocky soil of the Florida Keys and the Bahamas, where it attains a height of 6 meters, with a trunk diameter of 1.5 dm.

The branches are irregular, forming a flattish topped, irregular head. The bark is about 5 mm. thick, slightly fissured, red-brown internally and dark gray externally. The twigs are stout, roughened by numerous lenticels, red-brown or grayish brown. The leaves are persistent, evenly bipinnate; their leaf-stalk is 2 to 3 cm. long, deeply grooved, with a large conic gland at the end; there are 2, sometimes 4 pinnae, with stalks 1 to 2 cm. long, abruptly thickened at the base; the sessile leaflets are thick and leathery, obliquely obovate to nearly orbicular, 4 to 7 cm. long, rounded, shallowly notched

or seldom bluntly pointed, rounded or tapering at the unequal base, entire and revolute on the margin, light green and veiny, with stout prominent midrib. The



FIG. 477. — Black Bead, Inagua, Bahamas.

pink flowers appear from October to March, in loosely paniced, globose heads 2 to 3 cm. in diameter. The calyx is finely hairy, 5-lobed, much shorter than the corolla; stamens 2 or 3 times as long as the corolla. The pod is compressed, 10 to 15 cm. long, dark brown and hairy, finally bent into two almost complete circles, short-stalked and oblique at the base, abruptly taper-pointed at apex, splitting into 2 leathery valves, with a reddish inner surface and twisting into a tortuous mass; seeds compressed, about 12 mm. long, broadly ovate, black, with a bright scarlet ariloid fleshy stalk.

The wood is very similar to that of the preceding species, but lighter in color.

II. TEXAN EBONY

GENUS *SIDEROCARPOS* SMALL

Species *Siderocarpus flexicaulis* (Bentham) Small

Acacia flexicaulis Bentham

Pithecolobium flexicaule Coulter



HIS beautiful evergreen small tree or shrub occurs in Texas and southward into Mexico, attaining a height of 10 meters, with a trunk diameter of 9 dm.

The branches are zigzag and spreading; the twigs are stout, somewhat hairy, light green, soon becoming smooth, gray to reddish brown and bearing stipular spines 6 to 12 mm. long. The leaves are evenly bipinnate, 4 to 6 cm. long, including the slender leaf-stalk, which bears small glands; stipules spinose; there are 2 or 3 pairs of pinnæ, 3.5 to 4.5 cm. long, on stalks 5 mm. long; the leaflets, 3 to 5 pairs, are almost leathery, oblong, oval or obovate, 5 to 12 mm. long, sessile, usually blunt-pointed, rounded at the oblique base, dark green and shining above, paler and finely netted-veined beneath. The flowers, appearing from June to September, are fragrant and yellow, usually perfect, in cylindric spikes 2 to 4 cm. long on stout hairy peduncles 1.5 to 2 cm. long; the calyx is bell-shaped, 5-lobed, about 0.5 mm. long; corolla about 3 mm. long, its 5 lobes much longer than the tube; stamens numerous,

about 5 mm. long, united at the base into a tube the length of the corolla; ovary smooth and sessile; style thread-like. The fruit ripens in autumn, is narrowly oblong, straight or nearly so, somewhat flattened, hard and woody and lined with



FIG. 478. — Texan Ebony.

a thick, pith-like tissue; it is 10 to 15 cm. long, about 2.5 cm. wide, oblique at the base and sessile, rough, dull brown, finally splitting through the margin; the seeds are transversely arranged in the pod, oblong-obovate, more or less flattened, 12 to 15 mm. long, half as wide, dull red-brown with a slight depression on each side.

The wood is hard, compact, close-grained, dark red or purplish brown, with a yellowish sapwood; its specific gravity is about 1.04. It is highly esteemed for cabinet-work and is one of the most valuable woods of its region, its durability in contact with the soil also making it very desirable for fence posts. The green pods are used like beans, and the ripe seeds are roasted and used as a substitute for coffee by the Mexicans and Indians.

The genus is monotypic; its name, *Siderocarpus*, is Greek and refers to the hard, woody pod.

III. HUAJILLO

GENUS **HAVARDIA** SMALL

Species ***Havardia brevifolia*** (Bentham) Small

Pithecolobium brevifolium Benth



SMALL evergreen tree, often merely a shrub, occurring along the Rio Grande in Texas, but more abundant southward in Mexico. Its maximum height is 9 meters, with a trunk diameter of 1.5 dm.

The nearly erect branches are slender and form an irregular tree. The bark is thin, smooth, and gray; the twigs are somewhat angular, light gray at first, becoming dark brown, and bear persistent stout, stiff stipular spines about 1.5 cm. long. The leaves are evenly bipinnate, 7 to 9 cm. long, including the hairy leaf-stalk, which bears a prominent gland; there are 2 to 5 pairs of pinnæ 2.5 to 3 cm. long, nearly or quite sessile, the terminal pair being somewhat shorter than the basal; the leaflets, of which there are 10 to 20 pairs, are sessile, oblong, sometimes narrowly so, 3 to 7 mm. long, blunt or somewhat sharp-pointed, rounded at the unequal base, entire, pale hairy at first, becoming smooth, light green above, paler and finely netted beneath. The flowers are perfect, whitish or yellowish, in more or less hairy panicles 5 to 10 cm. long, of subglobose head-like clusters 1.5 to 2 cm. in diameter; calyx cup-shaped, the lobes triangular, about 1 mm. long; corolla tubular, about 4 mm. long, the 5 ovate lobes shorter than the tube; stamens numerous, 2



FIG. 479. — Huajillo.

to 3 times the length of the corolla, their filaments united into a tube at the base; ovary smooth and stalked; style filiform. The pod ripens in August and persists on the branches until the flowering season; it is linear-oblong, flat, leathery, 7 to 12 cm. long, about 1.5 cm. wide, taper-pointed, obliquely tapering into the stalked base, brown outside, yellow inside, splitting readily through the thick margin; the seeds are transverse in the pod, flattened, ovate to orbicular ovate, 6 mm. long, dark brown and shining, with an oval depression on each side.

The wood is rather hard, close-grained, dark red-brown, and very heavy.

There is but one species known of the genus *Havardia*; its name is in honor of Colonel Valery Havard, M.D., of the United States Army, who has made many valuable contributions to our knowledge of the botany of the various regions in which his active military career has stationed him.

IV. JULIBRISSIN

GENUS **ALBIZZIA** DURAZZINI

Species **Albizzia Julibrissin** Durazzini



N Asiatic tree, long planted for ornament and shade in the southern States, where it is hardy as far north as the District of Columbia; it has become naturalized in woods and thickets from Virginia to Florida and Louisiana. Its maximum height is 12 meters, with a trunk diameter of 5 dm.

The branches are long and wide-spreading, forming a rather round-headed tree. The bark is thin and scaly. The twigs are slender, somewhat angular, spineless, smooth, and yellowish brown. The leaves are evenly bipinnate, 2 to 4 dm. long, including the leaf-stalk, which is 1 to 1.5 dm. long; there are 8 to 12 pairs of pinnæ, all of nearly equal length, about 10 cm. long, and the axis terminated by a spine-like projection; leaflets 25 to 35 pairs, oblong, 10 to 15 mm. long, unequal, the upper margin being straight and scarcely 2 mm. from the midrib, which protrudes beyond the blade, forming a prominent tip, the lower margin rounded; the margins are strongly revolute, veins prominent; the upper surface is dark green, the lower surface is paler and hairy. The flowers are pink, in showy loose panicles of compact heads 4 to 6 cm. in diameter, on slender stalks 4 to 5 cm. long; the calyx is small, one third the length of the

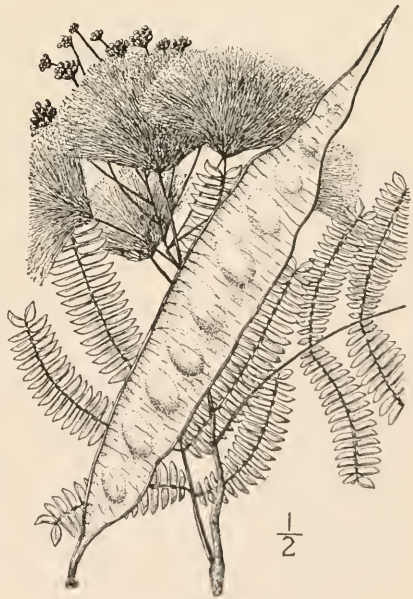


FIG. 480. — Julibrissin.

corolla, which is pink, funnel-form, its lobes ovate; stamens numerous, 3 to 3.5 cm. long, much exerted, the filaments united at the base; ovary short-stalked. The fruit is broadly linear, flat, 10 to 15 cm. long, sharp-pointed at each end, often slightly constricted between the seeds, smooth, straw-colored, papery, and dehiscent; the seeds, 8 to 10 in a pod, are oval, very flat, 8 to 10 mm. long and light brown.

The wood is hard, close-grained, dark brown; its specific gravity is about 0.77.

It is a rather rapid grower and a desirable tree on account of its showy flower heads and open feathery foliage. The generic name is in honor of the Italian naturalist, Albizzi. There are about 50 species known, of which this one is the type, all natives of Asia or Africa. *A. Lebbek*, a larger African tree with larger leaflets and pods, is much planted for shade in the West Indies.

V. WILD TAMARIND

GENUS **LYSILOMA** BENTHAM

Species ***Lysiloma bahamensis*** Bentham



THIS handsome tree is an inhabitant of sandy soils, in southern Florida, the Bahamas, and Cuba. Its maximum height is 16 meters, with a trunk diameter of 1.2 m. It has been confused with the similar *L. latisiliqua* of Haiti.

The branches are stout and spreading, forming a round-topped tree. The



FIG. 481. — Wild Tamarind.

bark is 4 to 12 mm. thick, smooth, gray to darkish brown, that of older trunks splitting into thick scales; the twigs are smooth or nearly so, reddish brown with wart-like markings, becoming light brown. The leaves are deciduous, evenly bipinnate, 10 to 14 cm. long, including the slender leaf-stalk, which bears a large gland near the first pair of pinnae; the leaf-like, acute, ovate stipules are 12 mm. long, and usually remain until the flowers appear; there are 2 to 5 pairs of pinnae 3.5 to 8 cm. long, stalked, the terminal pair being a little shorter than the basal; the leaflets, 10 to 30 pairs, are sessile, oblong or oblong-lanceolate, 8 to 15 mm. long, blunt at apex, unequally rounded at the base, entire, smooth, light green above, paler beneath. The white, usually perfect, flowers, appearing from October to June, are in terminal

racemes or axillary clusters, of globular heads, on peduncles 2 to 4 cm. long; the

heads are white-woolly before the flowers open, 1.5 to 2 cm. in diameter; the calyx is bell-shaped, broadly 5-lobed, 1 mm. long, about half the length of the corolla with its 5 reflexed lobes; stamens about 20, twice as long as the corolla, the filaments united into a slender tube toward the base; ovary smooth, nearly or quite sessile, the style filiform. The fruit ripens in autumn, remaining upon the branches for several months; it is flat, broadly linear or oblong, 8 to 15 cm. long, 2.5 cm. broad, straight or nearly so, wavy-margined, pointed at the apex, tapering at the base into a stalk 3 to 4 cm. long, dark brown, not splitting through its persistent margin but falling away from it by the slow disintegration of the papery valves; the seeds are transverse in the pod, oval to oblong, flattened, about 12 mm. long, dark brown and shining.

The wood is hard, not strong but tough, close-grained, dark reddish brown, the sapwood nearly white; its specific gravity is about 0.64. It is esteemed by boat and ship-builders.

The genus *Lysiloma*, of which this is the type species, consists of about 10 species, all tropical American. Its name is from the Greek, in reference to the way the sides of the pod separate from its margin.



FIG. 482. — Wild Tamarind, Inagua, Bahamas.

VI. THE ACACIAS

GENUS **ACACIA** [TOURNEFORT] ADANSON

ACACIA comprises about 450 species of trees, shrubs, and a few herbs. They are mostly armed and grow in warm, dry regions, being especially abundant in Australia, where some 300 species occur and where they are among the most valuable trees. There are no native living forms in Europe, although numerous fossil ones are known from the lower Eocene formation of that continent. In addition to the arborescent species in our area, there are about 10 shrubby species along our southern border. The well-known Gum arabic is a natural gummy exudation of several African species.

The leaves are usually evenly bipinnate, sometimes reduced to a dilated petiole (phyllode); the pinnæ are numerous, often with many leaflets; the stipules are small, deciduous or spinescent. The flowers are in globose heads or cylindric racemes or spikes, variously clustered, terminal or axillary, more or less bracteate, usually perfect, sometimes polygamous, small, yellow or white; the calyx is bell-shaped, 5-toothed, lobed or divided; petals 5, more or less united at the base, or seldom separate, rarely wanting; stamens 50 or more, exserted, free or but little united, filaments thread-like; anthers small; ovary sessile or stalked, 2- to many-ovuled, contracted into the long style. The fruit is oblong or linear, usually flat, straight or curved, mostly 2-valved.

The name is from the Greek, in reference to the spiny branches of many of these plants. The African *Acacia nilotica* Delile is the type species.

Our arborescent species are three:

Flowers racemose, slender-pedicelled; pod nearly straight.
 Flowers spicate, sessile; pod much curled and contorted.
 Flowers capitate; pod straight, but slightly compressed.

1. *A. Wrightii*.
 2. *A. Greggii*.
 3. *A. subtoruosa*.

1. TEXAS CATS-CLAW — **Acacia Wrightii** Benth

A small tree or shrub, with dense foliage and short spines, occurring in gravelly soil, from western Texas southward into Mexico, often becoming 9 meters high, with a trunk diameter of 3 dm.

The branches are spreading, and form an irregular tree; the bark is about 3 mm. thick, furrowed into ridges, which are broken into dark gray-brown scales; the twigs are somewhat angular, smooth, yellowish or reddish brown, soon becoming pale gray, and armed with stout recurved spines 4 to 6 mm. long. The leaves are evenly bipinnate, 2 to 3.5 cm. long, including the slender, sometimes glandless, slightly hairy leaf-stalk; there are 2 or 3 pairs of pinnæ 2 to 2.5 cm. long, and short stalked; the leaflets, 2 to 6 pairs, are sessile or nearly so, obliquely oblong to obovate, 5 to 7 mm. long, rounded, blunt or short-pointed at the apex, stiff, light green and smooth above, paler with prominent venation beneath.

The fragrant flowers, opening from March to August, are perfect, light yellow, in axillary racemes 3 to 5 cm. long, 1 cm. in diameter; pedicels short, slender, hairy; the calyx is minutely 5-lobed, hairy, about 1.5 mm. long; petals spatulate, 3 mm. long; stamens numerous, twice the length of the petals; ovary stalked and hairy. The fruit is flat, oblong, slightly curved, 8 to 11 cm. long, 2 to 2.5 cm. wide, pointed at the apex, tapering to the stout stalk, thick and often wavy on the margin, light reddish brown, thin and papery, marked by transverse veins, the seeds transversely attached, narrowly obovate, 6 mm. long, compressed, light brown, with an oval area on each side.

The wood is hard, close-grained, light brown, its specific gravity is about 0.94. It is largely used and highly esteemed for fuel in its native region.



FIG. 483. — Texas Cats-claw.

2. PARADISE FLOWER — *Acacia Greggii* A. Gray

This small tree is also called Catsclaw, Devil's claw, and Ramshorn; it occurs frequently near our Mexican border, in dry, gravelly soils, from western Texas to southern California, and southward into Mexico, attaining a maximum height of 9 meters, with a trunk diameter of 3 dm.



FIG. 484. — Paradise Flower.

sile, minutely 5-lobed, somewhat hairy, about 1.5 mm. long; petals broadly spatu-

The branches, bark, and twigs are very similar to those of *Acacia Wrightii*; the leaves are persistent, evenly bipinnate, 2.5 to 5 cm. long, including the slender leaf-stalk which has a brown gland near the middle; there are 1 to 3 pairs of pinnæ 2 to 4 cm. long, and short-stalked; leaflets 4 to 7 pairs, sessile, obliquely oblong or obovate, 4 to 6 mm. long, rounded, blunt, or short-pointed at the apex, thick and firm, light green, hairy, and prominently veined. The fragrant, yellowish flowers appear from April to September, in axillary clusters of 2 or 3 dense, hairy spikes 3 to 5 cm. long, 1 cm. in diameter, the peduncles 1.2 to 1.5 cm. long; the calyx is sessile, minutely 5-lobed, somewhat hairy, about 1.5 mm. long; petals broadly spatu-

late, 3 mm. long, united at the base, woolly margined; stamens numerous, about 6 mm. long; ovary stalked and hairy. The fruit is flat, linear-oblong, 8 to 12 cm. long, 1.5 to 2 cm. wide, much curved and contorted, and constricted between the seeds, usually rounded at the apex, obliquely tapering into a short stalk, light brown and thick margined, its valves membranous and transversely veined; the seeds are oval-orbicular, 6 mm. in diameter, dark brown, shining, with an oval depression on each side.

The wood is hard, strong, durable, reddish brown; its specific gravity is about 0.85.

It exudes a gum very much like gum arabic, and locally used as such, but not an article of commerce.

3. RIO GRANDE ACACIA — *Acacia subtortuosa* Shafer, new species.

A small tree, or more often a round-topped shrub 1 to 2 meters high, occurring in the Rio Grande region of southwestern Texas and adjacent Mexico, where it attains a maximum height of 6 meters, with a trunk diameter of 1.5 dm.



FIG. 485. — Rio Grande Acacia.

The trunk is short, with spreading branches. The bark is deeply fissured and dark brown. The twigs are hairy when young, becoming smooth and dark brown, bearing many whitish spines 2 cm. long or less. The leaves are equally bipinnate, 3 to 4 cm. long, including the short leaf-stalk, and composed of 3 or 4 pairs of pinnæ, each bearing 9 to 14 pairs of leaflets; these are linear, slightly curved, 1 to 2 mm. long, blunt or minutely tipped at the apex, nearly sessile, light green and smooth or somewhat hairy. The flowers are fragrant and bright yellow, appearing in March, in axillary clusters of 1 to 3 globular heads, 1 cm. in diameter, on slender peduncles 1.5 to 3 cm. long; calyx short, slightly hairy, one third as long as the corolla,

the stamens much longer than the corolla. The fruit is long-linear, 8 to 15 cm. long, 6 mm. broad, little flattened, reddish brown, finely hairy, and a little constricted between the many seeds, which are obovate, slightly compressed, 6 mm. long, nearly black, with a light brown obovate ring on each side.

This species has been confused with the similar *A. tortuosa* (Linnæus) Willdenow, of the West Indies. The type specimens were collected by Dr. E. Palmer, near Durango, Mexico, April and November, 1896, Nos. 11 and 510.

VII. FRANGIPANNI

GENUS **VACHELLIA** WIGHT AND ARNOTTSpecies **Vachellia Farnesiana** (Linnæus) Wight and Arnott*Mimosa Farnesiana* Linnæus. *Acacia Farnesiana* Willdenow

ALSO called Yellow opopanax, Sponge wood, Cassie, and Huisache, this is a small monotypic tree or shrub, probably native in Texas, thence southward to Chile, but is naturalized throughout the tropics, and occurs in our area from Florida to southern California, reaching a maximum height of 9 meters, with a trunk diameter of 4.5 dm.

The trunk is short, its branches are somewhat drooping, wide-spreading, forming a beautiful round-headed tree; the thin bark is broken into long ridges, peeling off in long thin red-brown scales; the twigs are slender, round, or slightly angular, smooth or nearly so, and armed with round, stiff whitish spines often 2.5 cm. long. The leaves are deciduous, evenly bipinnate, 4 to 8 cm. long, including the slender short leaf-stalk; there are 3 to 8 pairs of pinnæ 1.5 to 3 cm. long, sessile or nearly so, with 10 to 25 pairs of leaflets, which are linear-oblong, 2 to 6 mm. long, usually blunt pointed, unequal at the base, sessile or nearly so, light green and smooth on both sides. The flowers are very fragrant, bright yellow, appearing in summer and autumn in globular heads, which are white-woolly before the flowers open, on slender hairy peduncles 2.5 to 3 cm. long, in axillary clusters of 1 to 3 heads; the calyx is shallowly 5-lobed, half as long as and very similar in form and texture to the tubular corolla, which is 5-lobed, about 1.5 mm. long; stamens numerous, 2 to 3 times as long as the corolla, their filaments distinct; ovary sessile and hairy; style filiform. The fruit is stout, often thicker than wide, oblong or cylindric, straight or slightly curved, 3 to 7.5 cm. long, 1.5 cm. thick, contracted to a short thick point and narrowed to a very short stalk at the base, dark brown or purplish, somewhat shining, marked on the edges by a yellowish band, broadly grooved; seeds surrounded by a pulp and placed transversely in two distinct rows, oval, thick, 6 mm. long, light brown and shining.

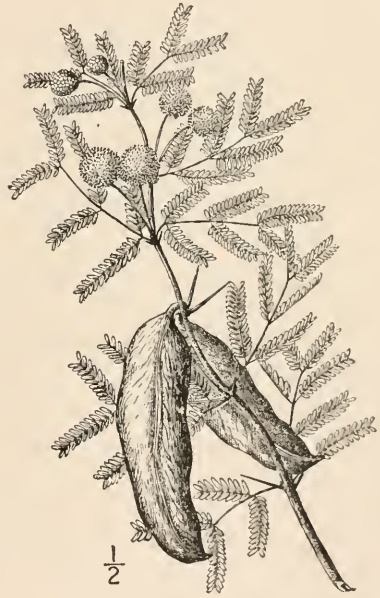


FIG. 486. — Frangipanni.

The wood is close-grained, hard, brownish red; its specific gravity is about 0.83.

It is largely cultivated in southern Europe for its flowers, which are used in

the manufacture of perfumery; the pods are sometimes used in tanning and dyeing. The plant is very ornamental and is used for hedges throughout the tropics. The generic name commemorates Rev. C. H. Vachell, an English missionary and botanical collector in China.

VIII. LEAD TREES

GENUS *LEUCÆNA* BENTHAM



EUCÆNA consists of about 15 species of evergreen, usually unarmed trees or shrubs, natives of the warmer parts of America, with probably one species in the islands of the Pacific Ocean; in addition to the arborescent species, one shrub, *Leucæna retusa* Bentham, occurs on our southwestern border.

The leaves are evenly bipinnate, with the leaflets large and in few pairs, or small and in numerous pairs. The flowers are white and mostly perfect, in axillary clusters or in terminal racemes of dense globose heads, the individual flowers being sessile in the axils of small bracts; calyx narrowly bell-shaped, 5-lobed; corolla of 5 distinct sharp or rounded petals; stamens 10, exserted, the filaments free; ovary stalked, many-ovuled, the slender style terminated by a small stigma. The fruit is a many-seeded legume; it is flat, broadly linear, with thickened margins, the transverse seeds obovate, flattened, usually brown and shining; endosperm hard, thin.

The name *Leucæna* is from the Greek and has reference to the white flowers; *L. glauca* (Linnaeus) Bentham is the type species.

Our arborescent species are:

Pinnæ 10 to 20 pairs; twigs finely woolly.

1. *L. pulverulenta*.

Pinnæ 6 to 10 pairs; twigs smooth.

Leaves without glands between the pinnæ; pod 7 to 15 cm. long.

2. *L. glauca*.

Leaves with a large gland between each pair of pinnæ; pod 15 to 20 cm. long.

3. *L. Greggii*.

I. MEXICAN LEAD TREE — *Leucæna pulverulenta* (Schlechtendal) Bentham

Acacia pulverulenta Schlechtendal

This handsome Mexican tree enters our area in the rich bottom lands along the lower Rio Grande in Texas, and is the largest and most stately tree of the Mimosa family occurring in the United States, often reaching a height of 18 meters, with a trunk diameter of 5 dm.

The trunk is straight and upright for several meters, and separates above into widely spreading branches, forming an open round tree. The bark is 6 mm. thick, light brown, breaking up into persistent scales; the twigs are somewhat grooved and finely hairy at first, becoming round and pale brown. The leaves

are evenly bipinnate, 1 to 2 dm. long, including the slender leaf-stalk, which is provided with a gland at the top or about midway from the base; there are 10 to 20 pairs of pinnæ, 3 to 5 cm. long and short-stalked; the leaflets, 15 to 30 pairs, are closely placed, linear, about 5 mm. long, bluntly pointed, oblique, and nearly or quite sessile, somewhat hairy at first, becoming pale, light green and smooth. The flowers appear during spring and summer on the new growth in axillary clusters of 2 to 4, long-stalked, globose heads 1.5 cm. in diameter, which are woolly before the flowers open; the bell-shaped calyx is 1 to 1.5 mm. long, obtusely 5-lobed and slightly hairy; petals about three times the length of the calyx, linear-spatulate, and sharp-pointed; the 10 stamens are scarcely twice the length of the petals; ovary nearly sessile and hairy. The fruit is flat, linear, often variable in length in the same cluster, from 1 to 2 dm. long, about 2 cm. wide, usually 2 or 3 in a cluster on a thickened stalk, rounded and tipped by a short point, tapering obliquely at the short-stalked base, brown and shining, splitting into thin leathery valves, 16 to 28 seeded; seeds obovate, 7 mm. long, dark brown and shining.

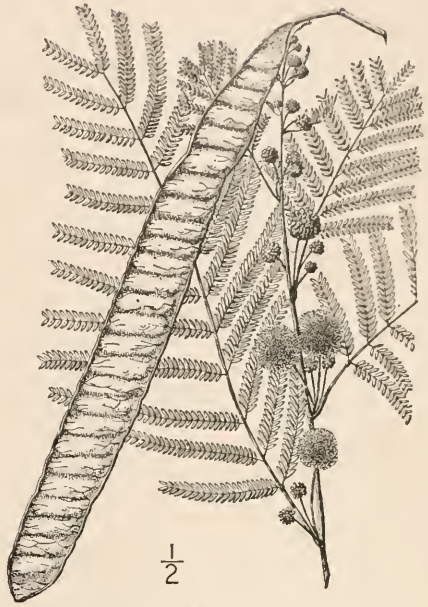


FIG. 487. — Mexican Lead Tree.

The wood is hard, close-grained, dark brown, with yellowish sapwood; its specific gravity is about 0.67. It is occasionally sawed into lumber and applied to ordinary local uses.

The wood is hard, close-grained, dark brown, with yellowish sapwood; its specific gravity is about 0.67. It is occasionally sawed into lumber and applied to ordinary local uses.

Its rapid growth, profusion of flowers, and beautiful feathery foliage recommend it as an ornamental and shade tree for the southern portion of our area. It is also called the Chalky *Leucæna*.

2. LEAD TREE — *Leucæna glauca* (Linnæus) Bentham

Mimosa glauca Linnæus

A shrub, rarely becoming a slender tree 10 meters tall, with a trunk diameter of 1 dm. It occurs in sandy soil in peninsular Florida, and is native and widely distributed in the American tropics whence it was introduced; it is also naturalized in the Philippine islands.

The bark is about 10 mm. thick, dark brown, somewhat ridged and broken into short, persistent scales. The twigs are slightly hairy at first, soon becoming smooth, dark or grayish brown. The leaves are evenly bipinnate, 1 to 3 dm. long, including the stout, round petiole which is 3 to 6 cm. long, with an enlarged

base and with or without a conspicuous gland; there are 3 to 10 pairs of pinnae 6 to 10 cm. long, and rather far apart, the upper scarcely shorter than the others, consisting of 10 to 20 pairs of short-stalked leaflets which are narrowly oblong to lanceolate, 8 to 15 mm. long, sharp-pointed, oblique at the base, entire, light green, pale underneath. The flowers appear in early spring in globose heads 1.5 to 3 cm. in diameter, in axillary clusters of 2 or 3 or in short terminal racemes, on stout, woolly peduncles 2.5 to 3 cm. long. The calyx, subtended by a peltate bract, is obconic, 1 mm. long, its small lobes short, blunt and hairy; petals 5, linear-spatulate and hairy; stamens 10, nearly 3 times the length of the corolla, with large oval anthers; ovary short-stalked and hairy. The pods are linear, 10 to 15 cm. long, about 1.5 cm. wide, flat, usually in clusters of 2 to 10, often of different lengths, thick-margined,



FIG. 488. — Lead Tree.

abruptly tapering at the apex, gradually narrowed at the base, brown and shining, splitting readily into 2 valves; seeds compressed, obovate, 8 to 10 mm. long, rounded at the apex, narrowed at the base, bright brown and shining.

The wood is hard, close-grained and light brown.

This plant is very common in the American tropics; horses are said to lose their tails and manes if they browse on the foliage. The seeds are used as beads with those of *Abrus precatorius* Linnæus, Prayer beads, and other seeds, in fancy work on some of the West Indian islands.

3. GREGG'S LEAD TREE

Leucaena Greggii Watson

A small tree known only from a limited area in southwestern Texas and adjacent Mexico, where it grows in ravines and along the banks of streams.

The twigs are stout, somewhat zigzag, yellowish hairy at first, becoming quite

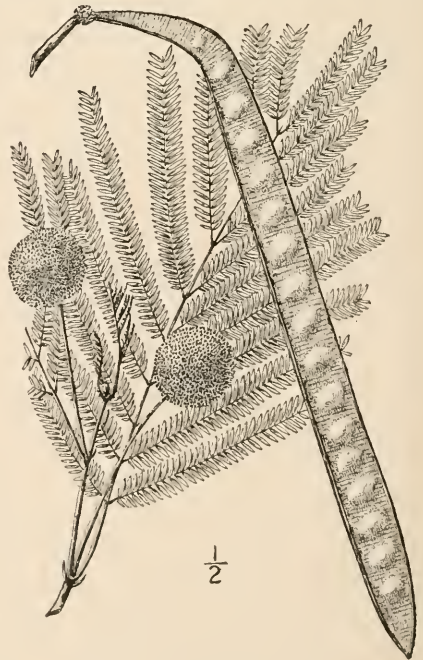


FIG. 489. — Gregg's Lead Tree.

smooth, and reddish brown. The bark is about 8 mm. thick, dark brown, furrowed into ridges and scaly. The leaves are evenly bipinnate, 1.5 to 2 dm. long, including the slender leaf-stalk which is about 3 cm. long, with spinescent stipules at its base 10 to 15 mm. long; there are about 12 pairs of distant pinnae, short-stalked, with a conspicuous gland between each pair; leaflets 16 to 30 pairs, lanceolate, 6 to 10 mm. long, sharp or taper-pointed and rounded on one side of the oblique base, sessile or nearly so, grayish green and hairy, becoming nearly or quite smooth. The flowers are in solitary or clustered globose white heads, on stout peduncles 5 to 8 cm. long, which have two bracts at the end, the heads 2 to 2.5 cm. in diameter. The calyx is obconic, hairy at the tip of the short lobes, about three fourths the length of the petals; stamens much exserted, their anthers small; ovary sessile and hairy. The fruit is very flat, linear, 1.5 to 2 dm. long, 10 to 15 mm. wide, pointed, tapering to the short, stout stalk, finely hairy until nearly ripe, when it is quite smooth. The seeds are oval, 12 mm. long, flat, notched at the base, dark brown and shining.

The wood is hard, close-grained and brown; its specific gravity is about 0.92.

IX. THE MESQUITES

GENUS *PROSOPIS* LINNÆUS



PROSOPIS includes some 15 species of trees or shrubs of dry or arid regions of tropical and subtropical portions of both the Old World and the New, most abundant in America. They are spiny or unarmed; some of them are of economic value, locally, for lumber and fuel; the pods of some species are used as food for both man and beast.

The leaves, which are mostly deciduous, are evenly bipinnate, with few pinnae and few or many leaflets. The perfect, greenish or yellow flowers are in spikes; calyx sessile, 5-lobed; corolla of 5 free or slightly united petals; stamens 10; ovary sessile or stalked, hairy or smooth, many-ovuled; style thread-like; stigma small. The fruit is an indehiscent legume, linear, compressed, or nearly round, straight or curved, often constricted between the seeds which are separated by a more or less spongy tissue, ovate to oblong and compressed; endosperm hard.

Prosopis is the Greek name of an unidentified plant, and why Linnæus applied it to these trees is not clear. The Persian plant *Prosopis spicigera* Linnæus is the type species.

Foliage smooth.

1. *P. glandulosa*.

Foliage densely hairy.

2. *P. velutina*.

1. MESQUITE — *Prosopis glandulosa* Torrey

Prosopis juliflora Brewer and Watson, not de Candolle

Also called Honey locust, Algaroba, Honey pod, and Ironwood, this is a small tree with a round symmetrical head, but more often an irregular crooked branched

bush or a mere straggling shrub; the large tap root is remarkable for the great depth to which it will extend for water in arid soils. It is found from Kansas to Nevada, Texas and California, and southward into Mexico. Its maximum height is about 10 meters, with a trunk diameter of 4 dm. This species has been confused with the Jamaican *Prosopis juliflora* (Swartz) de Candolle, which forms of it much resemble.

The bark is rather thick, shallowly fissured, with thick, reddish brown scales.



FIG. 490. — Mesquite.

The twigs are smooth or nearly so, yellowish green, becoming darker, mostly zigzag, and usually spiny. The winter buds are short and blunt. The leaves are evenly bipinnate with 1 pair of pinnæ (rarely 2), with round stalks 5 to 10 cm. long, thickened and glandular at the base, with a small gland and spine at the junction of the pinnæ; these are 7 to 14 cm. long, with short stalks; they have 6 to 25 relatively close or widely separated pairs of leaflets, which are linear or nearly so, 1.5 to 4 cm. long, blunt or sharp-pointed, leathery and bright green. The fragrant flowers appear from April until August, in cylindric spikes 4 to 8 cm. long, on slender nearly smooth peduncles 5 to 10 mm. long; calyx short-

stalked, bell-shaped, 1 mm. long, smooth, 5-lobed; corolla of 5 nearly erect, linear, sharp-pointed petals, 4 to 5 times the length of the calyx; stamens 10, nearly twice the length of the petals; ovary short-stalked and hairy. The pod is linear, round or nearly so when ripe, 1 to 2 dm. long, about 1 cm. thick, straight or nearly so, constricted between the seeds, abruptly contracted at each end and short-stalked, yellow, longitudinally veined, the thin outer coat enclosing a sweet pulp, which surrounds the obliquely transverse seeds, which are enclosed in thin sacs; seeds flattened, oblong, light brown and shining.

The wood is rather weak, hard, close-grained, dark red to brown, with yellow sapwood, its specific gravity about 0.76. It is much used and highly esteemed for fence posts and paving blocks, and applied to various other local uses, valued for fuel, and often made into charcoal. The wood of the root, which is often dug up for fuel, is much heavier, having a specific gravity of about 0.84.

The ripe pods are an important article of food for both man and beast in the desert regions.

2. ARIZONA MESQUITE — *Prosopis velutina* Wooton

This, the largest of the Mesquites, occurs in the hot dry valleys of the desert region of southern Arizona, southern California and Sonora, often becoming a

tree, with numerous irregular thick and crooked branches, attaining a height of 15 meters, and a trunk diameter of 6 dm.

The bark is rough, fissured, dark brown and scaly. The slender sometimes zigzag, often spiny twigs are velvety, grayish brown to yellowish brown. The winter buds are short, bluntish and hairy. The leaves, which are often clustered, are evenly bipinnate, with 1, or often 2, pairs of pinnæ, on very hairy stalks 4 to 6 cm. long and terminated by a small spine between the bases of the end pinnæ; the pinnæ are hairy-stalked with 12 to 20 pairs of leaflets, which are oblong or linear-oblong, 7 to 10 mm. long, blunt or pointed, leathery, light green, prominently veined and persistently hairy or becoming smooth. The flowers are in 1 to 3, clustered axillary dense cylindric spikes 5 to 7.5 cm. long, on stout, hairy peduncles about 2 cm. long; the bell-shaped calyx, with triangular lobes, is very velvety; petals 5, oblong, blunt-pointed and hairy on the inner surface; stamens 10, distinct and exserted; ovary nearly sessile and very hairy. The fruit is linear, slightly flattened, sometimes curved, 10 to 18 cm. long, 8 mm. wide, somewhat constricted between the seeds, abruptly pointed at both ends, short-stalked, indehiscent, pale yellow, slightly veined lengthwise, velvety when young, somewhat hairy when ripe.

The wood and fruit are put to the same uses as those of the preceding species, of which this tree is often regarded as a variety.



FIG. 491. — Arizona Mesquite.

X. SCREW POD MESQUITE

GENUS **STROMBOCARPA** A. GRAY

Species ***Strombocarpa odorata*** (Torrey) A. Gray

Prosopis odorata Torrey. *Prosopis pubescens* Benth



THIS small tree or shrub is also called Tornillo, and Screw bean. It is common in sandy or gravelly bottom lands, from western Texas to California; its maximum height is 10.5 meters, with a trunk diameter of 3 dm.

The bark is rather thick, light brown, and separates into long thin shaggy flakes; the twigs are round, finely hairy at first, becoming smooth, light reddish brown; they are armed with stiff stipular spines 8 to 20 mm. long. The leaves are deciduous, evenly bipinnate, usually with 1 pair of pinnæ, sometimes 2 pairs,

on slender leaf-stalks 1 to 2 cm. long, with a gland at the base of the pinnæ, which are 3.5 to 5 cm. long, short-stalked, and bear 5 to 8 pairs of leaflets; these are oblong, 1 to 2 cm. long, sharp-pointed, sessile or nearly so, finely hairy and prominently netted-veined. The flowers, appearing in April and continuing into the summer, are greenish white, in slender, stalked, axillary spikes 5 to 8 cm. long; the calyx is sessile, bell-shaped, slightly 5-lobed, hairy on the outside, one fourth to one third the length of the 5 lanceolate petals, which are pale-woolly on the inner

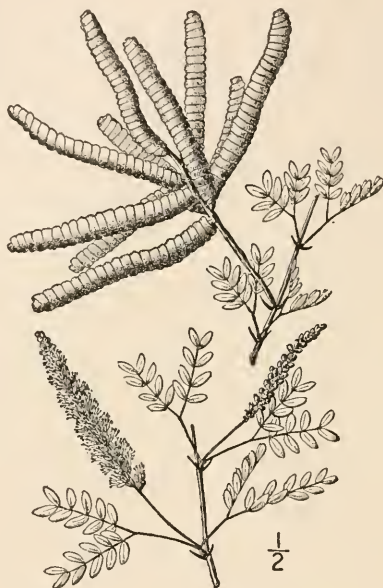


FIG. 492. — Screw Pod Mesquite.

surface; stamens 10, free and little exserted, about 4 mm. long; ovary stalked and hairy. The pods are borne in dense elongated clusters; they are sessile, tightly twisted, spiral cylinders 3 to 5 cm. long, about 8 mm. in diameter, pale yellow and woody without, pulpy within; seeds obovate, 1.5 to 2 mm. long, hard, pale brown, with horny endosperm.

The wood is very hard, brittle, close-grained, light brown; its specific gravity is about 0.76. It is sometimes used for fencing and often for fuel. The pods are edible and used for fodder in the absence of the more desirable Mesquite. The generic name is Greek, in reference to the coiled pod. There are about 6 species, of which one other, a shrub, occurs in Texas.

THE SENNA FAMILY

CÆSALPINIACEÆ Klotzsch & Garcke



ABOUT 100 genera, containing 1000 species of trees, shrubs, herbs, and vines, some of which are armed with very large, stout prickles, compose the Senna Family. They occur throughout the warmer temperate regions, but are most abundant in the tropics. The most important economic products of this family, are Senna and Logwood, the former being the leaves of several African species of *Cassia*; they are used for their laxative properties; this property is also possessed by many other species of the genus *Cassia* in a lesser degree. Logwood is the heartwood of the trunk and roots of *Hæmatoxylon campechianum* Linnæus, of the West Indies and Central America, and is to this day the most important of the vegetable dyes, most of which have been displaced by the products of synthetic chemistry.

The leaves of the Senna family are mostly compound, but simple in a few genera. The flowers are borne in various forms of clusters, seldom solitary, mostly perfect, sometimes monœcious, diœcious, or polygamous, nearly regular or quite irregular; the calyx consists of 5 more or less united sepals; corolla usually of 5 petals, imbricated, the lower ones enclosing the upper one in the bud; stamens 10, sometimes fewer, their filaments distinct or partly united; ovary 1-carpeled, 1- to many-seeded, usually sessile, but sometimes stalked, the style terminal. The fruit is a legume, 2-valved, mostly dehiscent; seeds with or without endosperm.

The arborescent genera of our area are

Flowers very irregular.

Leaves bipinnate; pod swollen, fleshy.

Leaves simple; pod flat, papery.

Flowers nearly regular.

Flowers diœcious or polygamous.

Pod flat, leathery; stamens longer than the small corolla.

Pod swollen, woody; stamens shorter than the large corolla.

Flowers perfect.

Leaf with a short, spur-like petiole, ending in a spine, the axis of the pinnæ broad and winged.

Leaf with a long petiole, the axis of the pinnæ not broad nor winged.

Calyx-lobes valvate.

Spiny; leaflets few; pod not over 10 cm. long.

Not spiny; leaflets many; pod over 20 cm. long.

Calyx-lobes imbricated; pod small, very flat.

1. *Tamarindus*.

2. *Cercis*.

3. *Gleditsia*.

4. *Gymnocladus*.

5. *Parkinsonia*.

6. *Cercidium*.

7. *Delonix*.

8. *Poinciana*.

I. TAMARIND

GENUS **TAMARINDUS** [TOURNEFORT] LINNÆUSSpecies **Tamarindus indica** Linnæus

HIS handsome tree is a native of the tropics, being found in the East Indies, West Indies, Arabia, and Egypt, also cultivated and more or less naturalized in all tropical countries; in our area it has become naturalized in peninsular Florida and on the Keys. Its maximum height is about 24 meters, with a trunk diameter up to 1.5 meters.

The branches are numerous and spreading, forming a dense, round-topped tree; the bark is about 6 mm. thick, slightly reticulate fissured, and brown; the twigs are zigzag, hairy at first, becoming quite smooth and grayish brown. The



FIG. 493. — Tamarind.

leaves are evenly pinnate, 7 to 10 cm. long, including the thickened, channelled stalk, with 10 to 18 pairs of sessile oblong leaflets 1.5 to 2 cm. long, blunt at both ends, entire margined, light green, and prominently veined. The flowers, appearing in Florida in April, are in loose racemes on hairy peduncles 7 to 10 cm. long; their pedicels are 10 to 12 mm. long; the calyx is tubular, 6 mm. long, smooth, yellowish, with oblong lobes, 2 of which are inferior; corolla of 5 petals, the upper 3 large, ovate, the middle one boat-shaped, toothed on the margin, yellow marked with red lines, the lower 2 very small; stamens 9, in 2 series, purplish, their filaments more or less united, only 3 of them perfect, with oblong anthers; ovary stalked, hairy; style awl-shaped, with a stigmatic tip.

The fruit is a somewhat swollen fleshy pod, dull brown and roughish, about 2.5 cm. broad, very variable in length and shape, depending upon the number of seeds, usually 1 to 4, often constricted between them; the seeds are ovate in outline, very angular, flat, about 12 mm. long, red-brown and shining and enclosed in a membranous sac which is surrounded by the thick acidulous pulp; the pod is indehiscent; its hard outer coating is brittle and breaks away from the pulp.

The wood is hard, close-grained, yellowish white, sometimes brownish; its specific gravity is about 0.95. It is sometimes used in general carpentry, and for charcoal. The pulp of the fruit, which is rich in citric, tartaric, and malic acids, is preserved in various ways and is used as a laxative or for acidulous beverages.

The name is Latinized from the Arabic, *Tamar hindy*, meaning Indian date, as the fruit of this tree, which is the type species, was called. The East Indian tree has a longer, less brittle coated, and more numerous seeded pod, and is

considered by some authors as distinct; in that case our tree would have to be known as *Tamarindus occidentalis* Gærtner.

II. THE REDBUDS

GENUS **CERCIS** LINNÆUS



ERCIS consists of some 6 species of small trees or shrubs, inhabitants of the temperate regions of both hemispheres. Fossils referable to this genus have also been found in the Eocene formation of Europe.

The leaves are deciduous, alternate, simple, entire, and long-stalked. The flowers are perfect, irregular, in simple clusters or racemes, on slender pedicels and borne on the branches of the previous year. The calyx is oblique, bell-shaped and 5-toothed, colored and persistent; corolla of 5 nearly equal rose-colored clawed petals, the standard the smallest, the keel larger than the wings; stamens 10, in two series, distinct, the inner series the shorter, their anthers oblong, versatile, opening lengthwise; ovary short-stalked, oblique, many-ovuled; style thick and fleshy, incurved and tipped by the obtuse stigma. The fruit is a very flat, papery legume, oblong or broadly linear, taper-pointed at each end, 2-valved, dark red-purple, reticulate veined, many seeded, one edge narrowly 2-winged; the seeds are transverse on slender stalks; they are ovate or oblong, flattened and reddish brown; the embryo is surrounded by a thin layer of endosperm.

Cercis is the Greek name of the Old World Judas tree, *C. Siliguastrum* Linnæus, the type of the genus. Our species are:

Leaves abruptly pointed; pod stalked in the calyx; eastern.

1. *C. canadensis*.

Leaves notched, rounded or blunt-pointed.

Leaves blunt-pointed; pod scarcely stalked in the calyx; Texan and Mexican.

2. *C. reniformis*.

Leaves rounded or notched; pod stalked in the calyx; Californian.

3. *C. occidentalis*.

1. REDBUD — **Cercis canadensis** Linnæus

This beautiful tree, which is also called the Judas tree, Salad tree, and Junebud, occurs from Ontario and New Jersey to Florida, and westwardly to Minnesota and Arkansas, where it is a common tree or large shrub, mostly in the rich soil of river valleys, attaining a maximum height of 15 meters, with a trunk diameter of 4.5 dm.

The bark is 12 mm. thick, deeply fissured into narrow ridges, which separate into thin reddish brown scales, that of the branches usually smooth; the twigs are slender, shining, light brown, becoming dull and gray-brown; the winter buds are 3 mm. long, bluntly ovoid and covered with brown scales. The leaves are rather thick, ovate-orbicular or reniform, 8 to 12 cm. long, abruptly contracted at the apex into a short, broad tip, more or less heart-shaped at the base, bright green and smooth above, paler and usually smooth, except along the hairy veins be-

neath; leaf-stalk round, slender, seldom as long as the blade, the stipules small, leaf-like, caducous. The flowers, appearing from March to May before the leaves, are in clusters of 4 to 8, their pedicels 5 to 12 mm. long; the calyx-tube is dark red or purple, 3 to 4 mm. long, its lobes short and rounded; petals pink or rose-colored, the standard oval, 7 to 8 mm. long, keel-petals concave, about 1 cm. long; ovary pubescent and short-stalked. The pods remain on the branches until winter; they are linear-oblong, 6 to 9 cm. long, nearly straight, tapering obliquely at each end, short-stalked, quite thin and papery, pinkish bronze and somewhat glaucous. The seeds are broadly ovate, 6 mm. long, light brown.



FIG. 494. — Redbud.

It is often cultivated for ornament in Europe and in this country. Its rapid growth, great beauty in its early profusion of bloom, and general neatness at all times, recommend it for use where a small tree or large shrub is desired.

2. TEXAN REDBUD — *Cercis reniformis* Engelm

Cercis occidentalis texensis S. Watson. *Cercis texensis* Sargent

A small tree or rather large shrub of Texas and adjacent Mexico, where it attains a height of 12 meters, with a trunk diameter of 3 dm. In the mountain valleys of Texas, however, it is usually a small shrub, often forming thickets.

The bark is smooth and light brown. The twigs, frequently hairy at first, become light brown and ultimately dark gray. The leaves are orbicular, 7.5 to 10 cm. long, scarcely as wide, bluntly pointed, deeply heart-shaped at the base, sometimes slightly wavy on the margin, smooth, dark green above, paler and sometimes hairy, especially when young, beneath; leaf-stalk relatively stout, enlarged at each end and often hairy. The flowers are rather small, densely clustered, on short slender stalks. The pod is very flat, linear-oblong, 6 to 10 cm. long, acute at each end, nearly or quite sessile in the persistent calyx; seeds ovate, about 5 mm. long, light brown.



FIG. 495. — Texan Redbud.

The wood is hard, close-grained, yellowish brown, its specific gravity about 0.75.

3. CALIFORNIA REDBUD — *Cercis occidentalis* Torrey

Usually a widely branched shrub, this species sometimes becomes a tree 6 meters tall. It occurs from the coast mountains to the western slopes of the Sierra Nevada of California, from the northern part of the state to San Diego county. It has also been found in Diamond Valley, Utah.

The twigs are slender, smooth and brown. The leaves are kidney-shaped, usually broader than long, 5 cm. to rarely 7.5 cm. wide, notched or blunt at the apex, shallowly or deeply heart-shaped at the base, entire on the margin, thick and leathery, bright green, smooth and somewhat shining on both surfaces; the leaf-stalk is slender, 2 to 2.5 cm. long. The flowers, which appear in March and April, are clustered, on rather long, slender stalks, the bell-shaped calyx usually of a dark reddish color, its teeth short and broad; petals magenta. The pod is flat, oblong, to linear-oblong, 5 to 7 cm. long, purplish, turning brown, tapering at each end and stalked in the calyx.



FIG. 496. — California Redbud.

III. THE HONEY LOCUSTS

GENUS *GLEDITSIA* [CLAYTON] LINNÆUS



GLEDITSIA contains about 11 species of trees, usually armed on the trunk and branches with simple or compound thorns. They occur mostly in the warmer portions of the north temperate zone, being most abundant in Asia, and eastern North America, and fossils from the Tertiary formations of Europe have been referred to the genus. The pulp of the pods of the Japanese tree has been used as soap; their wood is of but ordinary value.

The leaves are deciduous, evenly bipinnate or merely pinnate, often both on an individual leaf, stipulate; leaflets small, numerous, and scalloped. The flowers are polygamous, small, green or white, in slender axillary, usually spicate clusters; the calyx-tube is bell-shaped, nearly equally 3- to 5-lobed; the corolla of as many nearly equal petals as there are calyx-lobes; stamens 10, inserted with the petals on the margin of the disk, slightly exserted, on short, free filaments, the anthers uniform, 2-celled, much smaller or abortive in the pistillate flowers; ovary borne in the bottom of the calyx-tube, nearly sessile, rudimentary or absent in the staminate flowers; style short; stigma terminal, somewhat dilated, ovules 2 or many.

The fruit is a leguminous pod, usually many-seeded, rarely 1-seeded, elongated, straight, flattened, its walls hard and woody, dehiscent when old, usually pulpy between the seeds, which are transversely placed, obovate, compressed, borne on slender stalks, light brown, crustaceous; endosperm horny.

The name is in commemoration of the German botanist, John Gottlieb Gleditsch, a friend and contemporary of Linnæus. *G. triacanthos* is the type species. Our species are:

Pod oval or elliptic, 1- or 2-seeded; ovary smooth.

1. *G. aquatica*.

Pod linear or oblong-linear, many-seeded.

2. *G. texana*.

Pod 10 to 18 cm. long, not pulpy within.

3. *G. triacanthos*.

Pod 20 to 30 cm. long, pulpy within.

1. WATER LOCUST — *Gleditsia aquatica* Marshall

This rather handsome tree occurs in the coastal region from North Carolina to Florida, and extends westward to Indiana, Arkansas and Texas, forming considerable forests on rich lands of river valleys subject to overflow. Its maximum height is 20 meters, with a trunk diameter of 7.5 dm.

The trunk is often very short, dividing near the base into stout, rather crooked branches. The bark is about 4 mm. thick, dull gray to red-brown, shallowly fissured and broken into thin smooth plates. The twigs are smooth, yellowish brown, becoming gray or red-brown and shining. The spines are straight or slightly curved, with one or two short branches, dark reddish brown and shining, flat and ridged, very sharp, often 12 mm. wide at the base and 7 to 12 cm. long. The leaves are pinnate or bipinnate, 10 to 20 cm. long; leaf-stalk slender, round and smooth, 3 to 4 cm. long; there are 6 to 12 pairs of leaflets on the pinnate leaves and 3 to 12 pairs on the pinnæ of the bipinnate form; the leaflets are ovate to oblong or lanceolate, 2 to 3.5 cm. long, blunt or notched at the apex, rounded or narrowed at the base, often entire below the middle, dark green and shining above, dull green beneath. The flowers appear from April to June, in loose racemes 5 to 8 cm. long; the calyx is bell-shaped, its lobes lanceolate to oblong-lanceolate, blunt-pointed and slightly hairy; petals green, oblong or oval-oblong, rather longer than the calyx-lobes; stamens slightly exserted, the anthers green; ovary long-stalked and smooth. The fruit is oval or elliptic, oblique, 3 to 5 cm. long, 1.5 to 2 cm. wide, flat, pulpless, abruptly pointed at each end, long-stalked, brown and



FIG. 497. — Water Locust.

shining, its margins somewhat thickened; it contains 1 seed, rarely 2; seeds round, flat, brown and shining, about 1 cm. broad.

The wood is very hard, strong, coarse-grained and bright reddish brown; its specific gravity is about 0.73.

2. TEXAN HONEY LOCUST — *Gleditsia texana* Sargent

This rare and very local tree, is known only from dry bottom lands on the Brazos River, Texas; it has spreading branches but a narrow head, and attains a maximum height of about 36 meters, with a trunk diameter of 7.5 dm.

The bark is thin, close and smooth; the twigs are slender, somewhat zigzag, yellow at first, becoming gray, and they are spineless. The leaves are once or twice pinnate, about 15 cm. long, including the leaf-stalk, which, with the rachis, is slender and hairy at first, becoming nearly smooth; the pinnate form has 10 to 15 pairs of leaflets, the bipinnate form 3 to 7 pairs of pinnæ, with 8 to 14 pairs of leaflets, the lowest pair of pinnæ often reduced to simple leaflets. The leaflets are thick and firm, oblong to oblong-lanceolate, 1.5 to 2.5 cm. long, blunt or pointed at the apex, rounded at the base, deep green and shining above, hairy when young, pale and smooth except along the yellow midrib beneath. The flowers appear in April and May, in axillary racemes. The staminate flowers are yellow, in slender hairy often clustered racemes, 8 to 10 cm. long when fully grown; the calyx-tube is bell-shaped, its 5 lobes ovate, pointed, and hairy; the petals are somewhat longer and broader than the calyx-lobes; stamens exserted, the filaments slender, hairy near the base, the anthers green. The fruit is very flat, straight, linear-oblong, 10 to 13 cm. long, blunt at the tipped apex, obliquely rounded at the base, scarcely thickened along the margin, hairy, brown, and pulpless, containing many oval, dark brown and shining seeds 10 mm. long.



FIG. 498. — Texan Honey Locust.

3. HONEY LOCUST — *Gleditsia triacanthos* Linnæus

The Honey locust is also called Sweet locust, Black locust, Thorny locust, Thorn tree, Three-thorned acacia, and Honey shucks. It prefers rich river bottoms, seldom occurring on dry hills, from Ontario to Pennsylvania and Florida, and westward to Kansas and Texas, and is to some extent naturalized in the

northeastern States. Its maximum height is about 42 meters, with a trunk diameter of 1.8 dm.

The branches are spreading or somewhat pendulous. The bark is 1.5 to 2 cm.

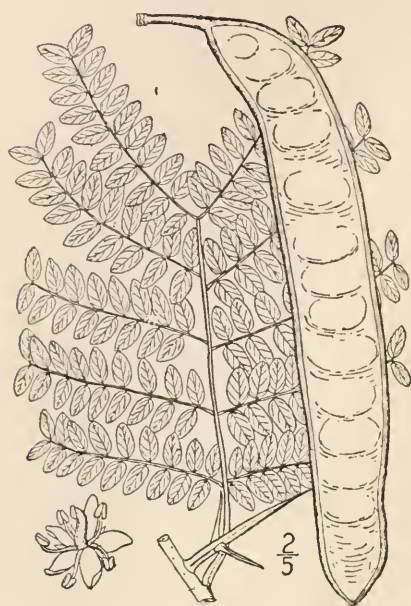


FIG. 499. — Honey Locust.

thick, deeply fissured into broad ridges, which are roughened by persistent brown scales with upturned edges. The twigs are stout, zigzag, with enlarged nodes, thickened at the tip, nearly smooth, becoming greenish red and shining and finally brown. The spines become 5 to 15 cm. long, simple or branched, stiff, very sharp, long-pointed and red-brown; they are produced by some trees in the greatest profusion, on others they may be entirely wanting. The winter buds are very small, usually several together. The leaves are pinnate or bipinnate, 1.5 to 2 dm. long; the leaf-stalk is enlarged at the base, flattened and grooved above, 3 to 5 cm. long; there are 9 to 14 pairs of leaflets on the pinnate form, or 4 to 7 pairs of pinnae on the bipinnate forms; the upper pinnae are the largest, 10 to 12 cm. long, the basal ones often reduced to a single

leaflet; the leaflets are ovate to lanceolate, varying to elliptic, 1.5 to 3 cm. long, blunt at each end, dark green and shining above, yellowish green and sometimes hairy beneath. The flowers appear in May or June, the staminate flowers in short, hairy racemes, with short peduncles; the pistillate are in few-flowered, usually solitary elongated racemes; the calyx is bell-shaped, unequally lobed, the lobes sharp-pointed and hairy; the petals are greenish, oval to oblong-oval, erect, and longer than the calyx-lobes; stamens 10, exserted, the anthers green; ovary woolly. The fruit is long-linear, 20 to 30 cm. long, about 3 cm. wide, flat, somewhat curved and twisted, brown to purplish black and shining, pointed, tapering toward the short-stalked base, the margin thickened, the walls tough, enclosing a sweetish astringent pulp; the numerous seeds are flat, oval, 12 mm. long, light brown and shining.

The wood is hard, strong, durable, coarse-grained, reddish brown, its specific gravity about 0.67; it is extensively used for fence posts, wheel hubs, and somewhat in general construction. Its rapid growth, graceful foliage, fine form, and freedom from disease or insects, render it a very desirable tree for lawns or parks; its lateness in leafing out, however, makes it of little value for shade.

IV. KENTUCKY COFFEE TREE

GENUS **GYMNOCLADUS** LAMARCKSpecies **Gymnocladus dioica** (Linnaeus) Koch*Guilandina dioica* Linnaeus. *Gymnocladus canadensis* Lamarck

HIS large tree, also called Coffee nut, Coffee bean, Nicker tree, and Mahogany, occurs from southern Ontario and Minnesota southward to Tennessee and the Indian Territory, growing in rich deep soil. It is often seen in cultivation in the northeastern States, and in Europe. It attains a maximum height of about 35 meters, with a trunk diameter of 9 dm.

The trunk is usually short and forks into several nearly upright branches. The dark brown bark is 2 or 3 cm. thick, deeply fissured into rough scaly ridges.

The twigs are stout, pithy, and slightly hairy at first, becoming brown and marked by large leaf scars. The leaves are deciduous, bipinnate, 3 to 9 dm. long and 4 to 6 dm. wide, with deciduous leaf-like stipules 1 cm. long; the first and often the second pair of pinnæ consist of entire leaflets, usually twice the size of the others; the pinnæ have 3 to 7 pairs of leaflets with or without a terminal one; leaflets ovate to oval, 3 to 7 cm. long, taper-pointed, rounded at the base, entire and short-stalked, thin, more or less woolly and pinkish when unfolding, dark green and shining above, pale green beneath. The flowers are polygamous, regular, in terminal racemes or panicles, the staminate clusters 7 to 10 cm. long, the pistillate 2.5 to 3 dm. long; the calyx is elongated, tubular, 10-ribbed and hairy, about 1 cm. long, its 5 lobes linear-lanceolate, 5 to 6 mm. long; petals 5,



FIG. 500. — Kentucky Coffee Tree.

nearly white, oblong, slightly keeled, somewhat longer than the calyx-lobes; stamens 10, shorter than the petals, the filaments awl-shaped and hairy, the anthers large, bright orange; ovary sessile, hairy; style short; stigma oblique. The fruit is a large woody legume, in clusters of 3 to 5, remaining on the branches all winter; it is flattish, oblong, 1.5 to 2.5 dm. long, 3.5 to 5 cm. wide, slightly curved, abruptly pointed, unevenly rounded into a stout stalk, dark red-brown and somewhat glaucous, the margins thickened; a dark, sweetish pulp surrounds the seeds, which are ovoid, a little flattened, 2 cm. long, hard, dark brown and dull, the endosperm thin.

The wood is rather soft, strong, coarse-grained, light brown; its specific gravity

is about 0.69. It takes a fine polish, is very durable, and used for fence-posts and in general construction. The seeds were used by the early pioneers of Kentucky as a substitute for coffee. It is often planted for ornament and shade, on account of its rapid growth, graceful foliage, and odd winter aspect.

The generic name is Greek, referring to its stout, naked branches. There is but one other species, *Gymnocladus chinensis* Baillon, a native of southern China; the American species is the type of the genus. Fossil remains referable to the genus have been found in the Tertiary formations of Europe.

V. THE HORSEBEANS

GENUS **PARKINSONIA** [PLUMIER] LINNÆUS



PARKINSONIA consists of but 3 species of thin-barked, spiny trees or shrubs of the warmer parts of America and Africa; the Horsebean, *Parkinsonia aculeata* Linnæus, has become naturalized throughout the tropics, having been grown and used as a hedge and fodder plant for a long time.

The leaves are alternate or clustered, on short leaf-stalks, which fork into 2 to 4 rachises bearing numerous pairs of small sessile leaflets. The flowers are perfect, nearly regular, axillary, racemose, the pedicels jointed; calyx short, bell-shaped, the 5 lobes nearly equal, reflexed; corolla of 5 yellow spreading petals, much longer than the calyx-lobes, the upper or standard broadest and clawed; stamens 10, in two series, their filaments distinct, hairy below, the anthers opening lengthwise; ovary borne at the base of the calyx-tube, short-stalked, hairy, many-ovuled, the style slender. The fruit is a linear legume, tapering at both ends, nearly circular in cross-section, constricted between the distant seeds, longitudinally veined, 2-valved and leathery; seeds few, longitudinally placed, brown and hard, the endosperm horny.

The type species is *Parkinsonia aculeata*. The name is in commemoration of John Parkinson, an English botanist, herbalist to James I, who died in 1750.

Our species are:

Racemes elongated; leaflets 20 to 30 pairs.

1. *P. aculeata*.

Racemes short; leaflets 4 to 6 pairs.

2. *P. microphylla*.

1. HORSEBEAN — *Parkinsonia aculeata* Linnæus

This graceful and striking little tree or shrub, also called Retama, is supposed to be native from the Rio Grande in Texas, southward into Mexico. It is well established and naturalized in all warm and tropical regions and occurs in our area from Florida to the Pacific coast. It attains a maximum height of about 9 meters, with a trunk diameter of 3 dm.

The short trunk divides into spreading or drooping branches. The reddish

brown bark is about 3 mm. thick, smooth or somewhat scaly. The twigs are zig-zag, short-hairy when young, smooth when older, yellowish green, and bear spines 2 cm. long or less. The leaves are obscurely bipinnate; the pinnæ, springing from a very short enlarged spinescent stalk, are 2 to 4 dm. long, with a very flat rachis 2 to 3 mm. wide, supporting 25 to 30 pairs of distant leaflets, which are linear-oblong to obovate, 1.5 to 8 mm. long, on very short slender stalks. The flowers are fragrant, light yellow, and often appear throughout the year in upright few-flowered racemes 7 to 15 cm. long; calyx-tube smooth, shorter than the oblong reflexed lobes; petals spreading, nearly orbicular, 1.5 cm. long, the upper one red spotted; stamens about half as long as the petals. The fruit is pendent, clustered, cylindric, 5 to 10 cm. long, rather narrow, long-tapering at each end, the calyx persistent at the base; it is dark yellow to brown, with a few soft hairs when young, becoming smooth; the seeds are far apart, oblong cylindric, 10 mm. long, 3 mm. in diameter.

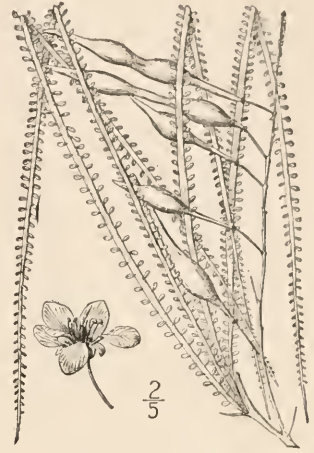


FIG. 501. — Horsebean.

The wood is hard, very close-grained, light brown with thick yellowish sapwood; its specific gravity is about 0.61. It is frequently cultivated for ornament and hedges and the foliage often used as fodder for goats and other domestic animals.

2. SMALL LEAVED HORSEBEAN — *Parkinsonia microphylla* Torrey

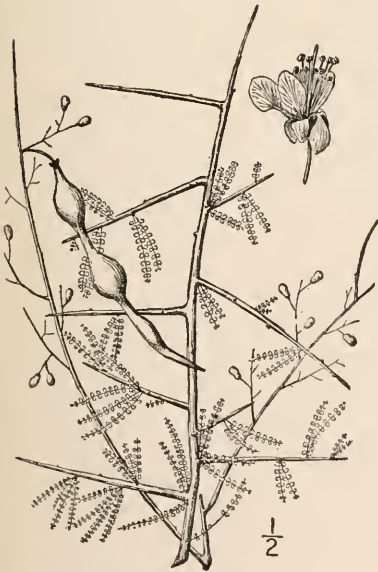


FIG. 502. — Small Leaved Horsebean.

A small, much branched spiny tree or shrub of rather rare occurrence in the deserts of southern Arizona, southern California, Sonora, and Lower California, sometimes reaching the height of 7.5 meters, with a trunk diameter of 3 dm.

The bark is up to 6 mm. thick, usually smooth or nearly so, dark yellow. The twigs are stout and hairy, yellowish green, soon becoming smooth, and terminated by stiff spine-like tips. The leaves are early deciduous, mostly falling away soon after unfolding; the pinnæ are 2.5 to 3 cm. long, the stalks slightly winged and grooved; the leaflets, 4 to 6 pairs, are rather distant, ovate to oblong or nearly round, 2 to 4 mm. long, blunt at each end, sessile, densely hairy when unfolding, less so when old. The flowers are pale yellow, ap-

pearing from April until June, often before the leaves, in few-flowered racemes about 2.5 cm. long, on slender pedicels 6 to 10 mm. long; the calyx-tube is short, its reflexed lobes deciduous; petals obovate, about 5 mm. long, spreading; stamens somewhat longer than the petals; ovary stalked and hairy. The pods, which hang on the branches for a long time, are cylindric, 5 to 8 cm. long, 10 to 12 mm. thick, tapering toward each end, long-stalked and constricted between the 1 to 3 seeds, which are elliptic, a little flattened, about 10 mm. long, pale and brown.

The wood is hard, close-grained, dark yellow-brown with yellow sapwood; the specific gravity is about 0.74.

VI. THE GREEN BARKED ACACIAS

GENUS **CERCIDIUM** TULASNE



ABOUT 5 species of trees and shrubs, with stout, crooked branches, bright green bark, and sharp axillary spines, compose the genus *Cercidium*. They occur only in the warmer portions of the western hemisphere. Three species are known from our area, 2 of which are arborescent.

The leaves are alternate, early deciduous, bipinnate, small, stalked, and usually without stipules. The flowers are very showy, nearly regular, few in axillary racemes; the calyx is tubular or bell-shaped, and persistent, its 5 pointed lobes reflexed; corolla golden yellow, of 5 broad nearly equal petals; stamens 10, borne on the margin of a disk, the upper one swollen near the base, the filaments free and hairy; anthers 2-celled, opening lengthwise; ovary short-stalked, smooth or hairy; style slender, the stigma very small. The fruit is a flat or somewhat swollen legume, at length dehiscent; the seeds, placed lengthwise in the pod on long stalks, are ovate, hard and flattened with thin horny endosperm.

The name applied to these plants is the Greek name of a weaver's instrument, of which the shape of the pod is suggestive; the type species is *C. spinosum* Tulasne, of South America. Our arborescent species are:

Leaflets green, somewhat glandular, not glaucous; pod flat.
Leaflets glaucous; pod somewhat swollen

1. *C. floridum*.
2. *C. Torreyanum*.

1. GREEN BARKED ACACIA — *Cercidium floridum* Benth

This small tree, with its bright green branches and golden-yellow flowers, is a conspicuous object in extreme southern Texas, where it occurs but sparingly, becoming more common, however, southward in adjacent Mexico. It is a low, crooked, wide-spreading tree, attaining a height of 6 meters, with a trunk diameter of 2.5 dm.

The bark is about 2 mm. thick, light greenish brown, smooth or nearly so. The twigs are slender, slightly zigzag, smooth or nearly so, olive-green, bearing

slender spines often 2.5 cm. long. The leaves are about 2.5 cm. long, usually composed of 1 pair of short pinnæ on a hairy stalk 5 to 7 mm. long; pinnæ 1.5 to 2.5 cm. long, stalked, bearing 2 to 4 pairs of leaflets, which are obovate or oblong-obovate, 4 to 6 mm. long, obtuse or notched at apex, nearly sessile, and somewhat glandular. The flowers appear with the leaves and continue for several months, so that ripe fruit and flowers are frequently found on the branches in mid-summer; they are in 3- to 5-flowered racemes, on slender stalks; the calyx-lobes are oblong, reflexed and deciduous; corolla 2 cm. across; petals broad, the standard orbicular to reniform, the others obovate to orbicular; ovary smooth. The fruit is flat, linear-oblong, 4 to 6 cm. long, straight or nearly so, narrowed toward each end, smooth, brownish yellow, splitting into 2 thin valves which are lighter within and expose 2 or 3 longitudinally placed seeds, which are flattened, oval, 1 cm. long, brownish yellow with darker sides and shining.

The wood is soft, close-grained, greenish yellow and satiny; its specific gravity is about 0.54. It is used for fuel.



FIG. 503. — Green Barked Acacia.

2. PALO VERDE — *Cercidium Torreyanum* (S. Watson) Sargent

Parkinsonia Torreyana S. Watson

Also called Green-barked acacia, and very similar to the tree just described, but perhaps more upright and irregularly branched. It is larger and occurs in the desert regions of Arizona, southern California, Sonora, and Lower California, where its brilliant flowers and green branches, even when devoid of foliage, are in strange contrast with the dreary surroundings. It attains a maximum height of 9 meters, with a trunk diameter of 5 dm.

The bark of old trees is 3 mm. thick, at times slightly furrowed, and scaly, but usually, as on the branches, smooth and bright green. The twigs are somewhat zig-zag, smooth, light yellow or pale green and glaucous, armed with spines 8 to 10 mm. long. The leaves appear in March or April, and fall off soon afterward, sometimes a second crop unfolds after an autumnal rain; they are pale hairy on expanding, about 2.5 cm.



FIG. 504. — Palo Verde.

long, composed of 1 pair of short pinnæ on a slender smooth stalk 5 to 7 mm.

long, each bearing 2 or 3 pairs of leaflets, which are oblong, 2 to 3 mm. long, blunt-pointed, oblique at the base, and glaucous. The flowers, appearing in April or May, are very similar to those of *C. floridum*, but a trifle larger and on stouter stalks. The fruit is oblong, 8 to 10 cm. long, somewhat swollen, abruptly narrowed at both ends, the upper edge more or less grooved, often slightly constricted between the seeds, which vary from 2 to 8, and are larger and not as flat as those of *C. floridum*.

The wood is soft, weak, close-grained, satiny, light brown, with yellow sapwood; its specific gravity is about 0.65. It is of little use except for fuel.

VII. FLAME TREE

GENUS **DELONIX** RAFINESQUE

Species **Delonix regia** (Bojer) Rafinesque

Poinciana regia Bojer



THIS deciduous-leaved tree, also called Flamboyant and Royal poinciana, is wide-spreading, flat-topped, and spineless. It is a native of Madagascar, but has long been planted throughout the tropics as a favorite ornamental shade tree, so that it has become naturalized in many countries, and is now spontaneous in southern peninsular Florida and on the Keys.

It is very common in the West Indies, where it attains a maximum height of about 12 meters, with a trunk diameter of 9 dm.

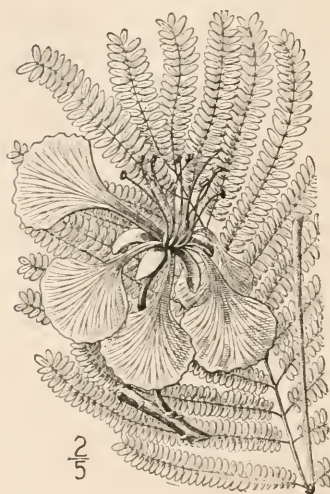


FIG. 505. — Flame Tree.

The bark is thin, slightly furrowed, and gray-brown. The twigs are stout, somewhat hairy, brown or brown-gray, and marked by small yellowish excrescences. The feathery leaves are without stipules, equally bipinnate, 3 to 5 dm. long, including the stout red or yellow stalk, which is 7 to 12 cm. in length; there are 10 to 25 pairs of pinnæ with a hairy rachis, and 20 to 40 pairs of oblong leaflets; these are 4 to 10 mm. long, rounded at each end, unequal at the base, the midrib and the thickened entire margin prominent, hairy on both sides and short-stalked. The orange-red or bright scarlet flowers are large, in ample terminal or axillary corymbose racemes, on stout pedicels; the 5 calyx-lobes are nearly equal, longer than the tube; petals spreading and reflexed, nearly orbicular, 5 to 7 cm. long, wavy or crisp on the margin, tapering into a long claw, scarlet veined and spotted with yellow; stamens 10, with very long exserted distinct filaments, the anthers large, opening lengthwise. The fruit is a rather flattened, elongated, linear, very hard woody pod, often 6 dm. long, slightly curved, gray to dark brown and rough, usually solid between the transversely placed seeds, which are nearly cylindric.

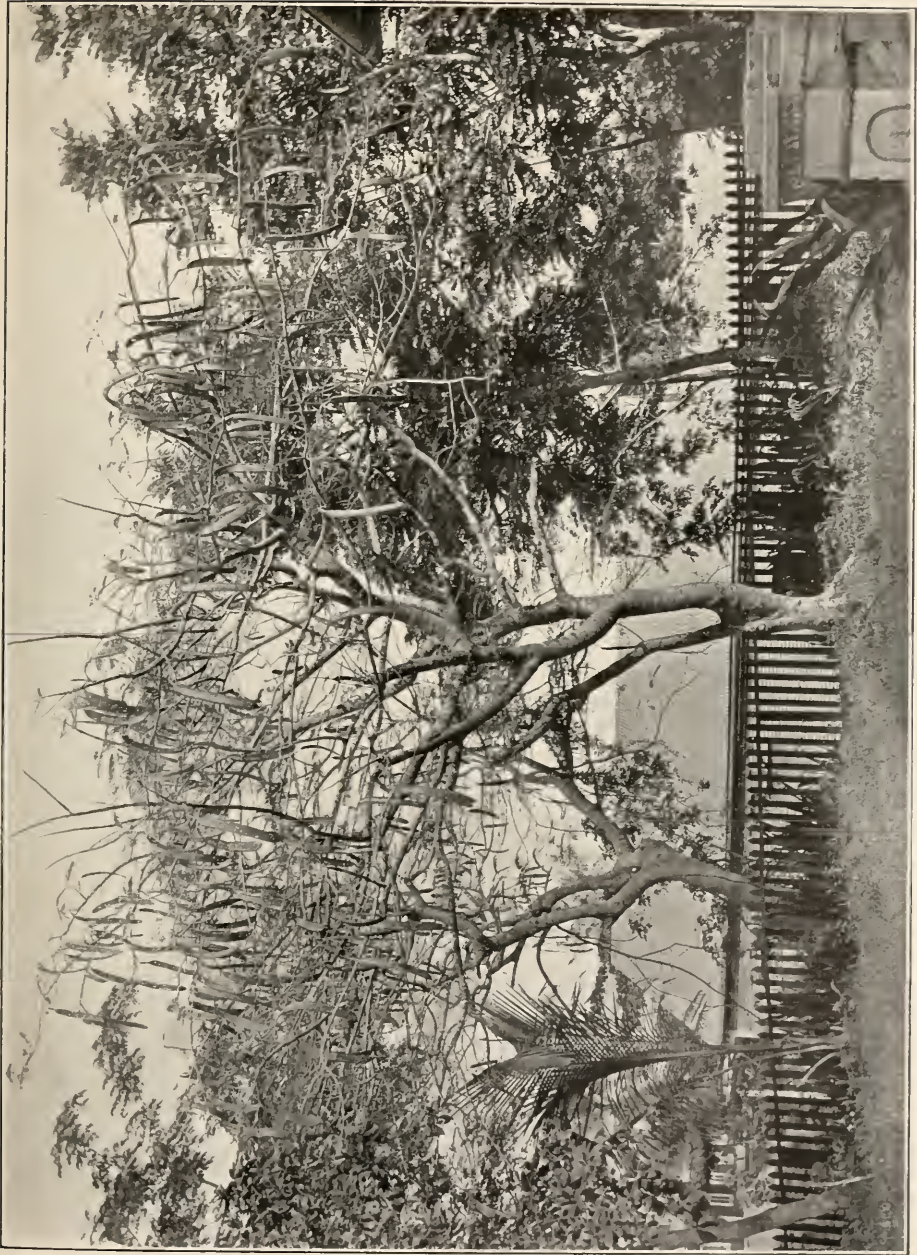


FIG. 506. — Flame Tree, Santurce, Porto Rico.

The wood is soft, weak, close-grained, whitish or yellowish; its specific gravity is about 0.83. The delicate foliage and profusion of gorgeous flowers make this a very elegant shade tree for the tropics. Its long period of leaflessness, weak, easily broken branches, and the continuous dropping of its great pods, are, however, undesirable features. The genus includes 3 species or more, natives of Africa; *D. regia* is the type. The name is Greek, in reference to the very evident claws of the petals.

VIII. BARBADOS FLOWER

GENUS *POINCIANA* [TOURNEFORT] LINNÆUS

Species *Poinciana pulcherrima* Linnaeus

Cæsalpinia pulcherrima Swartz



BARBADOS FLOWER is a beautiful small tree, or more often a shrub, supposed to be a native of Barbados, but it now occurs so frequently throughout the tropics, both wild and in cultivation, that there is some doubt as to its original home. It is also known as Barbados pride, Flower fence, and Bird of paradise flower, and has become naturalized in peninsular Florida. Its maximum height is 4 meters, with a trunk diameter of 10 cm.

The bark is thin, smooth or nearly so, and brown. The twigs are stout, smooth, sometimes armed with stout recurved prickles.



FIG. 507. — Barbados Flower.

The leaves are evenly bipinnate, 20 to 30 cm. long, including the long slender leaf-stalk. There are 4 to 12 pairs of pinnæ 4 to 10 cm. long, with 6 to 18 pairs of leaflets; these are thick and leathery, oblong to obovate, 15 to 25 mm. long, blunt, notched or short-pointed at the apex, rounded or wedge-shaped at the base, bright green above, paler, smooth, and prominently veined beneath. The flowers, which appear throughout the year, are very showy, bright red, sometimes yellow, in terminal racemes or panicles, on slender pedicels 4 to 9 cm. long; the calyx is 5-lobed, the lobes imbricated, the lower one the largest and overlaps the others; the 5 petals are unequal, 2 to 3 cm. long, crisp or wavy-margined; stamens 10, straight or nearly so; filaments distinct, very long-exserted; anthers opening lengthwise. The fruit is broadly linear, somewhat broadest toward the apex, which is unequally taper-pointed, narrowed or rounded at the short-stalked base, dark brown and roughish, separating into two twisting valves; the few seeds are obovate, somewhat angular, 8 to 10 mm. long, and yellowish brown.

The generic name is in honor of M. de Poinci, Governor of the Antilles about 1650, and a patron of botany. There is but one other species in the genus as here understood, our plant being the type.

THE PEA FAMILY

FABACEÆ Reichenbach



THIS is a very large family, comprising some 325 genera, including probably 5000 species of trees, shrubs, herbs, woody and herbaceous climbers, of wide distribution, most abundant in the warmer temperate regions of both hemispheres. They are of vast and varied economic importance; the seeds of many, as beans, peas, and peanuts, are of the highest nutritive value on account of the large quantity of albuminous matter stored in them. Many are of great medicinal value, and some of them are very poisonous, such as the Calabar bean, the seed of *Physostigma venenosum* Balfour, and the bright scarlet seeds of *Abrus precatorius* Linnæus, a tropical climbing vine, are as intensely poisonous as they are brilliant. Many furnish valuable timber, and numerous genera supply important forage plants such as the Clovers, Alfalfa, Lupines, and Melilots. Their value as concentrators of nitrogen in the soil is inestimable; many dyes are also derived from plants of this family, indigo being the most important, and the ornamental plants belonging here are very numerous.

The *Fabaceæ* have alternate stipulate leaves which are mostly compound. The flowers are usually perfect, rarely polygamous or diœcious, solitary or in various simple or compound clusters, axillary or terminal, irregular. The calyx is 4- or 5-toothed, rarely cleft, and often 2-lipped; corolla pea-like (papilionaceous); its 5 petals are distinct or somewhat united, usually of 3 kinds, the broad upper one, which in the bud surrounds or encloses the others, is known as the standard or banner, the 2 lateral are called the wings, and the 2 lower, more or less united, are called the keel; stamens 10 or sometimes only 9, rarely there are but 5; their filaments are usually united into 1 or 2 groups, rarely separate; usually 9 are united into a split tube, the 10th being free; pistil a single carpel, simple and superior; the ovary 1-celled or several-celled by transverse partitions; style simple; stigma terminal, oblique or lateral; ovules 1 to many. The fruit is a 2-valved dehiscent legume, or indehiscent, often more or less modified; seeds usually without endosperm, the cotyledons thick.

There are about 75 genera with some 1250 species in our area; the following are arborescent:

Stamens 10; filaments distinct.

Flowers racemose; pods swollen, constricted between the seeds.

Flowers paniculate; pods flattened.

Stamens 10 or fewer; filaments united in one or two groups.

Leaves more than 3-foliolate.

1. *Sophora*.

2. *Cladrastis*.

Leaves glandless.

Pods dehiscent.

Leaves unequally pinnate, sometimes equally pinnate in *Olneya*.

Pods flat, wing-margined on one side.

3. *Robinia*.

Pods not winged on the margin.

Flowers racemose; branches spiny.

4. *Olneya*.

Flowers solitary or obscurely racemose; branches unarmed.

5. *Coursetia*.

Leaves equally pinnate; flowers very large.

6. *Agati*.

Pods indehiscent, 4-winged.

7. *Ichthyomethia*.

Leaves glandular or dotted; petals all distinct.

8. *Eysenhardtia*.

Leaves not more than 3-foliolate, usually unifoliolate, very small and early deciduous (in our species).

9. *Parosela*.

I. THE CORAL BEANS

GENUS *SOPHORA* LINNÆUS



SOPHORA includes 25 or 30 species, mostly trees or shrubs, a few, perennial herbs, natives of warm and tropical regions of both the Old World and the New. They have unarmed stems and branches, odd-pinnate leaves and showy flowers in racemes or panicles. The calyx is bell-shaped with short teeth; the standard is obovate to orbicular, the wings obliquely oblong, the keel oblong, straight or nearly so; the 10 stamens are all separate or nearly separate, their anthers versatile; the pistil has a short-stalked ovary and incurved style. The pod is leathery or fleshy, constricted between the seeds, usually not splitting open, containing several or many seeds. The generic name is from the Arabic, signifying yellow, the flowers being that color in many species. *Sophora tomentosa* Linnæus, is a shrub of tropical seacoasts, occurring in Florida. The Japanese *Sophora japonica* Linnæus, is much planted for ornament. The type species of the genus is the Asiatic *Sophora alopecuroides* Linnæus. Our arborescent species are:

Racemes terminal; leaves thick, persistent.

1. *S. secundiflora*.

Racemes axillary; leaves thin, deciduous.

2. *S. affinis*.

1. EVERGREEN CORAL BEAN — *Sophora secundiflora* (Cavanilles) de Candolle

Virgilia secundiflora Cavanilles

This shrub or small tree inhabits borders of streams and seacoasts from Texas to New Mexico, southward, in Mexico, to Nuevo Leon and San Luis Potosi. It sometimes becomes about 12 meters high, with a trunk 2 dm. in diameter, and is known in Mexico as Frigolito.

The young twigs are finely velvety, becoming smooth and brown. The evergreen stalked leaves have from 7 to 11 thick leathery leaflets, which are oblong to

obovate blunt or slightly notched at the apex, narrowed at the base, a little hairy beneath when young, but becoming smooth, 2.5 to 6 cm. long, shining and bright yellowish green on the upper surface, paler and dull on the under side. The racemes are borne at the ends of branchlets, appearing with the leaves of the season in February or March; the axis of the racemes, the pedicels and calyx, are finely velvety; the pedicels bear two small pointed bractlets at about the middle; the violet-blue flowers are 2 to 3 cm. long and strongly fragrant; the ovary is white-silky. The pod is hard and woody, 2 dm. long or less, about 1.5 cm. thick through the seeds, much constricted between the seeds, densely velvety; the oblong red bony seeds are 1 to 1.5 cm. long, without endosperm, and are very poisonous.

The wood is hard, close-grained, orange-red with yellow sapwood; its specific gravity is about 0.98.



FIG. 508. — Evergreen Coral Bean.

2. DECIDUOUS CORAL BEAN — *Sophora affinis* Torrey and Gray

An inhabitant of hillsides and river valleys in southern Arkansas and Texas, this small tree attains a maximum height of only about 7 meters, with a trunk up to 2.5 dm. in diameter.

The thin reddish brown bark peels off in thin scales. The young twigs are green and slightly hairy, becoming brown and smooth; the winter buds are small, brown-hairy. The deciduous leaves are stalked and have 11 to 16 oblong thin short-stalked leaflets, which are blunt, finely hairy when young, but smooth or nearly so when old, 2.5 to 4 cm. long, their yellowish midribs rather prominent on the dull green under side, the upper side darker green and somewhat shining. The racemes, which appear in April or May, are axillary, drooping, mostly shorter than the leaves, the axis slender; pedicels and calyx densely silky-hairy; the pedicels are 1 cm. long or less; the calyx is about 4 mm. long, and the white or pinkish corolla about 1.5 cm. long; the ovary is stalked and hairy. The pod is



FIG. 509. — Deciduous Coral Bean.

fleshy, black and shining, 8 cm. long or much less, deeply constricted between the seeds, which have a thin layer of endosperm.

It is also known under the names Pink locust and Bearded locust.

The wood is very hard and strong, close-grained and light red; its specific gravity is about 0.85.

II. KENTUCKY YELLOW WOOD

GENUS **CLADRASTIS** RAFINESQUE

Species **Cladrastis lutea** (Michaux) K. Koch

Virgilia lutea Michaux. *Cladrastis tinctoria* Rafinesque



KENTUCKY YELLOW WOOD is an interesting and ornamental tree, native of the southeastern States, from western North Carolina through Tennessee and Kentucky to Missouri; it prefers rich valley soil and is quite local in distribution, attaining a maximum height of about 20 meters, with a trunk 6 or 7 dm. thick. It is a monotype, no other species of *Cladrastis* being known; its Manchurian relative, sometimes known as *Cladrastis amurensis* Benthams, belonging to the similar genus *Maackia* (*Maackia amurensis* Ruprecht and Maximowicz).

The bark is thick, brown or brownish, nearly smooth. The young twigs are greenish brown, slender, somewhat drooping, at first a little hairy, but soon smooth, brown and shining; the winter buds are small, oblong, blunt, brown-hairy, borne 4 together and enclosed in the base of the leaf-stalk. The odd-pinnate, deciduous stalked leaves have neither stipules nor stipels; the 5 to 11 leaflets are thin, short-stalked, ovate, oval or obovate, 10 cm. long or less, pointed at the apex, blunt, narrowed or wedge-shaped at the base, entire-margined, finely hairy when young, smooth or but slightly hairy on the under side when mature, the upper surface bright green, the under side paler. The numerous showy white flowers are in large terminal drooping panicles, and appear in May or June; the slender flower-stalks are 1



FIG. 510. — Kentucky Yellow Wood.

cm. long or more; the slightly hairy calyx is narrowly bell-shaped with 5 short and broad rounded teeth; the corolla is about 2 cm. long, the standard orbicular, the wings and keel-petals oblong; the 10 stamens are separate, with slender filaments and versatile anthers; the ovary is linear, short-stalked, long-hairy and contains several ovules, and is tipped by the incurved style. The pod is linear,

smooth, short-stalked in the persistent calyx, 4 to 8 cm. long, 8 to 10 mm. wide, tipped with the persistent subulate style, and contains few oblong flattened seeds without endosperm.

The name *Cladrastis* is Greek, signifying brittle branches. The wood is yellow, hard, strong, with a specific gravity of about 0.63, and has a limited use for gun-stocks. A yellow dye is extracted from it. The tree is desirable for lawn and park planting as far north as New York and central Ohio; it is also called Yellow locust, Yellow ash and Gopher-wood.

III. THE LOCUSTS

GENUS **ROBINIA** LINNÆUS



ROBINIA comprises about 7 species of trees or shrubs confined to North America. Fossil remains referred to the genus, however, have been found in central Europe.

They have slender zigzag twigs and small naked buds. The leaves are alternate, unevenly pinnate, the nearly opposite leaflets without glands; the stipules become spinescent. The flowers are on long pedicels in short nodding racemes in the axils of the leaves, with early deciduous bractlets; the calyx is bell-shaped, 5-toothed, the upper teeth shortest and somewhat united; the standard is broad and reflexed; wings curved and separate; keel petals curved, united below; stamens 10, inserted with the petals, 9 of them united at the base, their anthers all alike, or nearly so, ovate; the ovary is stalked, linear-oblong; style awl-shaped; stigma small; ovules many. The fruit is a many-seeded, flat, 2-valved narrow legume, wing-margined on one edge, short-stalked, membranous, smooth or prickly; the seeds are obliquely placed, oblong with a hard coat, thin endosperm and large embryo.

The name is in commemoration of Jean Robin (1550-1629) and his son Vespasien (1579-1660), distinguished Paris botanists. The type species is *R. Pseudacacia*. In addition to the 3 arborescent species, 4 shrubby ones occur in our area. The trees are much ravaged by the locust borer.

Racemes loose; pods smooth; eastern tree.

1. *R. Pseudacacia*.

Racemes dense; pods glandular-hispid.

Twigs viscid; eastern tree.

2. *R. viscosa*.

Twigs not viscid; southwestern tree.

3. *R. neo-mexicana*.

1. LOCUST — **Robinia Pseudacacia** Linnæus

This well-known tree is native in the mountains from Pennsylvania to Georgia, and perhaps westward to Iowa and Kansas. It is widely naturalized throughout the eastern United States and in Canada and much planted in Europe and in the western States.

The trunk is usually divided into several leading branches; these are slender,

usually erect, forming an oblong tree. The bark is 2.5 to 4 cm. thick, somewhat porous, deeply furrowed into roundish ridges of a reddish brown color. The twigs are round or nearly so, slightly hairy at first, soon becoming smooth and brown. The pinnate leaves are 1.5 to 3 dm. long, consisting of 7 to 19 leaflets and a



FIG. 511. — Locust, Carnot, Pennsylvania.

grooved stalk 2.5 to 4 cm. long thickened at the base. The leaflets are thin, elliptic or ovate, 2.5 to 4.5 cm. long, rounded and often minutely bristle-pointed, the base rounded, the margin entire; their short stalks are about 4 mm. long; they are silvery white at first, soon becoming dull green and smooth above, paler and smooth beneath, or slightly hairy on the midrib. The stipules are about 12 mm.

long, awl-shaped, soon developing into hard, straight or slightly curved spines, becoming 2.5 cm. long and often persisting for several years. The flowers appear from April to June in loose racemes 10 to 12.5 cm. long, with 10 to 25 flowers on pedicels 6 to 15 mm. long; they are white, with a yellow spot on the standard and very fragrant. The pod is linear, slightly curved, smooth, reddish brown, flat, soon dehiscent; the seeds, 4 to 10 in each pod, are kidney-shaped, about 4.5 mm. long, yellowish brown with darker blotches.

The wood is very hard, strong, close-grained, brown or greenish yellow; its specific gravity is about 0.73. It is very durable, being one of the most lasting of woods in contact with the soil, a favorite for fence posts, also used in ship-building and turnery. The bark of the root is of some medicinal repute.

This tree has long been planted in Europe and America as a forest tree or for ornament, and a great many varieties have developed, especially in Europe; it produces suckers very freely from cut stumps and is difficult to eradicate from fields or lawns.

It is also called Black locust, Yellow locust, White locust, Red locust, Green locust, Honey locust, Peaflower locust, Post locust, Acacia, False acacia, Parasol acacia, Bastard acacia, Locust tree, Silver chain and White laburnum.



FIG. 512. — Locust.



FIG. 513. — Clammy Locust.

2. CLAMMY LOCUST

Robinia viscosa Ventenat

This small tree is better known from cultivated specimens than in the wild state, in which it is very rare, being known only from a few localities in mountain woods, from North Carolina to Alabama; it has often escaped from gardens in eastern Canada and the eastern States. Its maximum height is 12 meters, with a trunk diameter of 3 dm., and it is also known as Honey locust, Red flowering locust, Rose flowering locust and Rose acacia.

The slender branches are spreading, forming a roundish head. The bark is about 3 mm. thick, roughish and dark gray or brown. The twigs are viscid, reddish brown and covered with glandular hairs. The leaves are 1.5 to 3 dm. long, consisting of 11 to 27 leaflets and a stout nearly round petiole which is often glandular and viscid, and slightly enlarged at the base; the leaflets are rather thick and firm, ovate, oblong or elliptic, 2.5 to 4 cm. long, rounded or pointed and bristle tipped at the apex, rounded or tapering at the short-stalked base, entire on the margin, dark green and smooth above, pale and somewhat hairy, especially along the yellowish venation beneath; the stipules are slender, rarely developing into slender spines. The flowers, appearing in May and June and often again in the autumn, are odorless, in dense racemes 5 to 8 cm. long; the slender peduncle and pedicels are covered with long glandular hairs. The calyx is red and hairy, its lobes awl-shaped; the corolla is pink or flesh colored; the standard narrow and marked with yellow blotches; the wing petals are broad. The fruit is linear, flat, 5 to 10 cm. long, somewhat glandular, hispid and viscid, sunken between the seeds, tapering at each end and tipped with the remnants of the style; seeds about 4 mm. long, reddish brown, mottled.

The wood is hard, close-grained and brownish; its specific gravity is about 0.81.

It is well known in cultivation as a handsome flowering tree; there are several varieties, some of which are probably hybrids with the common locust.

3. NEW MEXICO LOCUST — *Robinia neo-mexicana* A. Gray



FIG. 514. — New Mexico Locust.

A small tree of mountain sides near streams in New Mexico, Arizona and southern Colorado, at altitudes of 1200 to 3000 meters. It attains a height of 7.5 meters, with a trunk diameter of 3.5 dm. in Colorado, but is usually a shrub and commonly called Locust.

The trunk has a thin, nearly smooth bark of a light brown color, breaking into small scales. The twigs are covered with brown glandular hairs which persist for at least one season, after which they become reddish brown and often glaucous. The leaves are 1.5 to 3 dm. long, consisting of 13 to 21 leaflets and a stout hairy petiole which is grooved on the upper side. The leaflets are thin, oblong to ovate, about 4 cm. long, rounded, sometimes notched and

bristle-pointed, wedge-shaped or rounded at the base, entire on the margin, hairy when unfolding, soon becoming smooth and bluish green above, paler with con-

spicuous veins beneath; the principal veins and the petioles are hairy; the stipules, which are thin and flexible at first, develop into brown-red spines, sometimes 2.5 cm. long. The flowers open in May or June in dense, racemes and sometimes again in August; the stout peduncle and slender pedicels and the calyx are covered with glandular hairs. The flowers are pale rose colored, sometimes nearly white; the standard and wing petals are very broad. The pod is narrow, 7.5 to 10 cm. long, reddish brown, glandular hairy, tapering at each end, bearing the recurved, persistent style at the apex; the seeds are about 3 mm. long, dark brown and blotched.

The wood is very hard, strong, close-grained and yellow with brownish markings; its specific gravity is about 0.80. The tree is hardy as far north as the New England States.

IV. SONORA IRONWOOD

GENUS **OLNEYA** A. GRAY

Species **Olneya Tesota** A. Gray



MOST beautiful tree of wide distribution in the desert regions of the southwestern United States and adjacent Mexico, reaching a height of 9 meters, with a trunk diameter of 4.5 dm. It is called Palo de Hierro and Arbol de Hierro by the Mexicans.

The trunk is short and stout, usually forking into several nearly upright branches. The bark is thin and scaly, peeling off in long reddish brown strips. The twigs are whitish hairy, soon becoming green, marked with red and finally turning light brown. The spines, which are often in pairs below the leaves, are straight or nearly so, very stiff and sharp, 3 to 10 mm. long and persist for several years. The pinnate leaves are somewhat persistent, 2 to 6 cm. long, consisting of 10 to 15 leaflets and a slender grooved petiole 6 to 10



FIG. 515. — Sonora Ironwood.

mm. long, often fascicled and without stipules; the leaflets are oblong-obovate, 8 to 20 mm. long, blunt or minutely tipped, wedge-shaped at the base, entire on the margin and short-stalked; they are whitish-hairy, the lower surface conspicu-

ously veined. The flowers unfold with the leaves from March to July in short axillary whitish-hairy racemes with sharp bractlets that fall off before the flowers expand. The flowers are purplish, about 15 mm. long on pedicels about the length of the calyx; calyx-lobes are about equal, ovate and blunt; the disk is cup-shaped and joined to the calyx-tube; the petals are purplish or violet; the standard is roundish and deeply notched, reflexed, and appendaged at the base; wings oblique, oblong, about equaling the incurved keel; stamens 10, one of them separate; anthers all alike; ovary sessile or slightly stalked, softly hairy; the style bent inward, bearded above; stigma thick and fleshy; ovules many. The fruit, which ripens in August, is a somewhat flattened 2-valved, leathery pod, light brown and glandular-hairy, the base subtended by the persistent calyx, the apex tipped with the style; the 1 to 5 seeds are ovoid, about 8 mm. long, dark brown and shining.

The wood is hard and strong, but brittle, and dark brown; its specific gravity is about 1.15, being considerably heavier than water. It is difficult to work but is sometimes made into canes and is highly prized for fuel.

The genus contains but one species; its name is in commemoration of Stephen T. Olney (1812-1878), a prominent manufacturer and amateur botanist of Rhode Island.

V. TEXAN COURSETIA

GENUS *COURSETIA* DE CANDOLLE

Species *Coursetia axillaris* Coulter and Rose



PROFUSELY branched shrub or small tree several meters tall, known only from the vicinity of San Diego, Texas.

The unarmed twigs are zigzag, hairy at first becoming smooth and light gray. The leaves are alternate, clustered on short spur-like branches, odd-pinnately compound, 1 to 2 cm. long, consisting of 7 to 11 leaf-



FIG. 516. — Texan Coursetia.

lets, the lower pair orbicular or oval, the others obovate or oblong-obovate, blunt at the apex, rounded at the base and entire on the margin, light green, prominently reticulated, nearly smooth above, minutely hairy beneath. The flowers are solitary or in few-flowered racemes, on pedicels that eventually become 5 to 10 mm. long. The calyx-tube is bell-shaped, its lobes longer than the tube, triangular or lanceolate, acute, nearly equal, the upper pair slightly united; corolla white, the standard reflexed, 12 mm. broad; wings free; keel petals incurved; stamens 10, the filaments of 9

united for more than half their length; anthers all alike; ovary sessile; style incurved, hairy along the inner side; stigma capitate; ovules several. The pod is linear, 2 to 3.5 cm. long, smooth, 2-valved, marginless, bristle-pointed at the apex, narrowed at the base and constricted between the seeds, which are compressed, orbicular, about 2 mm. in diameter, shining and red-brown.

The genus embraces about 15 species of trees or shrubs confined to the warmer portions of the New World, *Coursetia tomentosa* (Desfontaines) de Candolle, of Peru, being the type species. The name is in honor of G. Dumont de Courset (1746-1824), a French scientist.

VI. AUSTRALIAN CORKWOOD TREE

GENUS **AGATI** ADANSON

Species **Agati grandiflora** (Linnæus) Desvaux

Robinia grandiflora Linnæus. *Sesbania grandiflora* Poiret



THIS tropical Asiatic tree has been cultivated for its large showy flowers and for shade in all warm countries and has become quite widely naturalized, especially in the West Indies, whence it was introduced into southern Florida, where it is now spontaneous in sandy soils. Its maximum height is about 9 meters.

The twigs are stout, densely hairy at first. The leaves are long and narrow, evenly pinnate, 1.5 to 3 dm. long, consisting of 10 to 20 pairs of leaflets; these are oblong, 2 to 2.5 cm. long, rounded at each end, or minutely tipped, short stalked, light green and smooth above, scarcely paler and slightly hairy beneath. The flowers are very large, in few-flowered, short, hairy racemes; their calyx is cup-shaped, shallowly 2-lipped; corolla white or red, 7.5 to 10 cm. long; the standard shorter and narrower than the keel petals; stamens 10, one of them separate from the 9 others. The fruit is a linear pod often 3 dm. long, about 8 mm. wide, light yellow, very thick on both edges, somewhat sunken in between the seeds, the valves thick and spongy, splitting freely through the thick edges; seeds numerous, compressed, kidney-shaped, about 6 mm. long and brown.



FIG. 517. — Australian Corkwood Tree.

This corkwood is soft, coarse-grained and white; its specific gravity is about 0.51; it is not durable and of little use. The flowers and the green pods are eaten

as a salad or pot herb, both in the East and West Indies. The astringent bark is also used medicinally, especially in Asiatic countries. The genus consists of only this species; its name is Malabaric.

VII. JAMAICA DOGWOOD

GENUS **ICHTHYOMETHIA** PATRICK BROWNE

Species ***Ichthyomethia Piscipula*** (Linnæus) A. S. Hitchcock

Erythrina Piscipula Linnæus. *Piscidia Erythrina* Linnæus



JAMAICA DOGWOOD is quite abundant on the sandy coastal lands of southern peninsular Florida and the Keys, and is common in the West Indies and also in southern Mexico. Its maximum height is about 17 meters, with a trunk diameter of 9 dm.

The usually crooked branches are upright or ascending. The bark is 3 mm. thick, light reddish brown, its surface broken into small scales. The twigs are thickly brownish hairy at first, soon becoming quite smooth, reddish brown. The



FIG. 518. — Jamaica Dogwood.

leaves are alternate, without stipules, deciduous, 1 to 3 dm. long, consisting of from 5 to 11 leathery leaflets and a stout petiole somewhat enlarged at the base. The leaflets are oblong to obovate or rarely ovate, 5 to 10 cm. long, abruptly pointed or blunt, rounded at the base, entire or slightly wavy on the margin, hairy at first, soon becoming smooth and dark green above, paler and rusty hairy along the prominent midrib beneath. The flowers are in large lateral, grayish hairy panicles on leafless branches of the previous season; the calyx is bell-shaped and persistent, its 5 lobes short, triangular; the petals are white with a

reddish tinge; the standard is suborbicular and notched, grayish hairy on the outer surface, green blotched within, its claw almost as long as the calyx; wings oblong-spatulate; keel-petals broad and curved, their claws connected; stamens 10, the filaments of 9 united into a tube, the other one free only at the base, being united with the tube above; anthers all alike; ovary linear, sessile and silky, contracted into a thread-like inwardly bent style; stigma capitate; ovules many. The fruit is a stalked 4-winged legume, linear, 5 to 10 cm. long, indehiscent, hairy or smooth, grayish brown, the thin wings 1 to 2 cm. wide. The flattened seeds are oval, red-brown and dull.

The wood is weak, close-grained, yellowish brown; its specific gravity is about

o.87. It is very durable, takes a fine polish and is a favorite in Florida for boat building, fuel and charcoal. The bark, especially of the root, contains a sedative principle somewhat similar in its action to morphine; and the fluid extract is used to some extent in American medical practice.

The genus is monotypic, and was established by Patrick Browne, by reference to Linnæus' name for the tree, and by a good description of it. Its name is from the Greek in reference to the use of the bark of its roots as a fish poison, the Caribs having used it to stupefy fish, a practice still carried on by negroes.

VIII. EYSENHARDTIA

GENUS **EYSENHARDTIA** HUMBOLDT, BONPLAND AND KUNTH

Species **Eysenhardtia orthocarpa** S. Watson



EYSENHARDTIA contains 5 species of shrubs and small trees growing naturally from the southwestern United States to Guatemala. It is named in honor of Karl Wilhelm Eysenhardt, Professor of Botany at Königsberg (1794-1825); the type species is *Eysenhardtia amorphoides* Humboldt, Bonpland and Kunth, a shrub of wide distribution from New Mexico to Guatemala. Our tree species, *E. orthocarpa*, occurs from Arizona and western Texas to Oaxaca and Hidalgo; it is not known to exceed 7 meters in height, with a trunk 2 dm. thick.

The bark is thin, light gray and scaly, the young twigs finely hairy, becoming smooth and red-brown. The deciduous leaves are stalked, equally pinnate, with 10 to 24 pairs of leaflets, the leaf-axis grooved on the upper side and finely hairy; the leaflets are thin, oblong to oval, 2 cm. long or less, blunt or slightly notched at the apex,



FIG. 519. — *Eysenhardtia*.

short-stalked, very glandular and hairy on the under side, smooth or nearly so and light green on the upper; the minute stipules are subulate. The small white flowers are in axillary hairy spikes, which appear in Arizona in May, but specimens from central Mexico show flowers collected in July and in October; the spikes are densely many-flowered, 10 cm. long or less; the calyx is ribbed, glandular and hairy, about 3 mm. long; the petals are 6 to 8 mm. long, oblong to spatulate, clawed, the standard only a little wider than the wings and keel; there are 9 stamens united by their filaments into a tube, and one separate shorter stamen; the ovary contains 2 to 4 ovules and is tipped by a hooked style. The pods

are narrowly oblong, pendent, smooth, pointed, about 1.5 cm. long, nearly straight, and usually bear only one flat seed.

The wood is hard and dense, reddish brown, with a specific gravity of 0.87.

IX. INDIGO BUSH

GENUS **PAROSELA** CAVANILLES

Species **Parosela spinosa** (A. Gray) Heller

Dalea spinosa A. Gray



THIS small spiny tree, or more often a much branched shrub, occurs in the deserts of southern California, southwestern Arizona and adjacent Mexico. Its maximum height is 6 meters, with a trunk diameter up to 5 dm. It is also called *Dalea* and Indigo thorn.

The trunk is usually very short, branching near the base. The bark is about 5 mm. thick, deeply fissured into grayish brown scales. The twigs are slender, finely hairy; spines 5 cm. long or less. The leaves are few near the bases of the spine-



FIG. 520. — Indigo Bush.

like twigs, consisting of but one leaflet, which is wedge-shaped, about 2 cm. long, bluntly pointed, sessile or nearly so, wavy and glandular on the margin, and whitish hairy; they fall off soon after unfolding. The flowers appear in June or July in racemes 2.5 to 4 cm. long, the white hairy rachis spine-tipped; they are short-stalked; the calyx-tube is 10-ribbed, glandular between the ribs, its blunt lobes ovate; the petals are dark blue; stamens united into a tube, the anthers all alike, often with a gland, 2-celled and opening lengthwise; ovary sessile, hairy and glandular; style slender; ovules usually 2.

The fruit is a one-seeded, compressed ovate pod about 8 mm. long, partly enclosed by the persistent calyx and tipped by the withering style; seed kidney-shaped, about 3 mm. long, shining, brown and mottled.

The wood is soft, rather coarse-grained, and brown; its specific gravity is about 0.55. Seedling plants bear oblong or oblanceolate toothed leaves sometimes 4 cm. long.

The genus is wholly American, comprising about 100 species of herbs, shrubs and a few trees, most of them being native in the southwestern United States, Mexico and Central America.

The generic name is an anagram of *Psoralea*, a genus of closely related plants. The type species is *Dalea obovatifolia* Ortega, a Cuban herbaceous species. The

generic name *Dalea*, published for these plants by Ortega in 1800, is preceded by *Dalea* of Gærtner, published for a different genus in 1788.

The *Parosela arborescens* (Torrey) Heller, was originally described as a small tree from the San Fernando Mountains in southern California, but has not since been met with as such. It differs from the above in being less spiny, having more numerous hoary leaflets and close, spike-like inflorescence.

Coral bean, *Erythrina arborea* (Chapman) Small, a shrub or woody herb, with armed stems, sometimes 6 meters high, occurs in sandy soil in southern peninsular Florida and on the Keys. Its leaves are 3-foliolate, the leaflets deltoid or hastately 3-lobed, 3.5 to 10 cm.-long, their rachis and petioles wiry; flowers scarlet, 3 to 4 cm. long, in racemes up to 2 dm. long; the pods are 8 to 12 cm. long and constricted between the scarlet seeds. By some this plant is considered to be a form or variety of the herbaceous *Erythrina herbacea* Linnæus, which ranges further northward, from North Carolina to Florida and Texas; and it cannot, with certainty, be regarded as a tree.

THE CALTROP FAMILY

ZYGOPHYLLACEÆ Lindley



ZYGOPHYLLACEÆ consists of about 20 genera including some 150 species of herbs, shrubs and trees, widely distributed in warm and tropical regions. They have opposite stipulate pinnate leaves with entire leaflets. Their flowers are regular, perfect and stalked, either axillary or terminal, and solitary or clustered; there are usually 5 sepals and 5 petals and twice as many stamens as there are petals, the stamens having versatile anthers; the ovary is several-celled, with either one or several ovules in each cavity; the united styles are terminal. The fruit, in our species, is nearly dry, capsular, splitting when ripe into two carpels or more.

The North American tree genera are:

Filaments not appendaged; leaflets broad.

1. *Guaiacum*.

Filaments appendaged; leaflets narrow.

2. *Porlieria*.

LIGNUM VITÆ

GENUS **GUAIAECUM** [PLUMIER] LINNÆUS

Species ***Guaiacum sanctum*** Linnæus



THE genus *Guaiacum* contains several species of trees and shrubs, with evergreen leaves, widely distributed in the American tropics. *G. sanctum* inhabits southern Florida, growing on several of the Keys, and occurs throughout the Bahamas, in Porto Rico, Haiti, Cuba, and Yucatan. The generic name is Carib; *Guaiacum officinale* Linnæus is the type.

The tree attains a maximum height of about 10 meters, with a short trunk up to 1 meter in diameter; on the Bahamas it sometimes blossoms as a mere shrub. The thin bark is light gray, separating on the surface into thin scales; the branches are irregular, spreading or somewhat drooping, isolated trees being nearly round in outline, or even broader than high. The young twigs and leaves are slightly hairy, but soon become smooth; the branchlets are much thickened at the nodes, light gray and somewhat ridged. The leaves are petioled and have 3 or 4 pairs (occasionally only 2 pairs) of leathery oblong or obovate leaflets, which are blunt or minutely tipped, sessile or nearly so, finely veined, with veins radiating from the base, 3 cm. long or less, dark green on both sides. The beautiful flowers are borne at the ends of twigs, their slender hairy peduncles minutely bracted at the base, and appear from February to April; the hairy sepals are shorter than the

blue petals; the slender filaments are not appendaged. The fruit is an obovoid rather fleshy capsule, strongly five-angled, 17 mm. long or less, short-stalked in the persistent base of the calyx, bright orange when ripe; it contains black elliptic seeds provided with a scarlet aril.

The dense resinous wood is heavier than water, its specific gravity being about 1.15; in color it varies from light yellow to greenish, the heartwood being much darker than the sapwood; it is sometimes called Ironwood.

The wood, on account of the resin, is used medicinally as a diaphoretic and alterative, like that of its more southern relative *G. officinale*, the resin of which, however, is preferred.



FIG. 521. — Lignum Vitæ.

NORTHERN PORLIERA

GENUS **PORLIERA** RUIZ AND PAVON

Species **Porlieria angustifolia** (Engelmann) A. Gray

Guaiacum angustifolium Engelmann



PORLIERA contains several species of shrubs and trees, distributed from the Sonoran region to Chile; they differ from *Guaiacums* in having filaments which are appendaged by a scale, and their leaflets are narrow. The generic name commemorates Porlier de Baxamar, a Spanish patron of Botany. The type species is the South American *Porlieria hygrometra* Ruiz and Pavon.

Porlieria angustifolia inhabits plains or prairies in Texas and northern Mexico. While usually a shrub, it sometimes becomes a tree up to 7 meters in height, with a trunk up to 2.5 dm. thick, its branches spreading or straggling. The leaves have from 4 to 6 pairs of linear coriaceous leaflets, and are short-stalked and smooth; the leaflets are 1.5 cm. long or less, 2 to 3 mm. wide, distinctly netted-veined, minutely tipped, somewhat oblique at the sessile base. The flowers are borne at the ends of short branches and are 1 to 2 cm. broad; the concave round sepals are about 5 mm. long, half as long as the ellip-



FIG. 522. — Northern Porlieria.

tic lilac-purple petals; the filaments are pink and the anthers bright yellow; the ovary is finely hairy. The fruit is from 2-lobed to 4-lobed.

The wood is hard, compact, the heart wood dark brown, the sapwood yellow; it is heavier than water, the specific gravity being about 1.10. It has medical properties similar to Guaiacum wood, but less active.

THE RUE FAMILY

RUTACEÆ Jussieu



ALTHOUGH the typical genus of this family, *Ruta*, is composed of herbaceous plants, the Garden rue (*Ruta graveolens* Linnæus) being its most familiar species, there are over 100 genera with probably 1000 species of trees and shrubs included in it, especially occurring in tropical regions; many of these are armed with prickles. The leaves are usually pinnately compound, the leaflets always dotted with pellucid oil-glands, readily seen by the aid of a hand-lens. The small regular and usually perfect flowers are in variously clustered cymes; there are from 3 to 5 imbricated sepals, as many petals as there are sepals, and usually as many stamens, though sometimes more; the pistil has from 2 to 5 separate or united carpels. The fruit is various in the different genera.

Aside from the Citrus fruits, the family yields little of economic value except a few drugs, most important of which are Jaborandi or Pilocarpus, the leaflets of *Pilocarpus microphyllus* Stapf, and of *P. Jaborandi* Holmes, both of Brazil; Buchu, the leaves of several species of *Barosma* from southern Africa; Angustura or Cusparia bark, of the South American tree *Cusparia Angustura* (A. Richard) Lyons, and the bark and fruits of the Prickly ashes. Bengal quince or Bael fruit, *Ægle Marmelos* (Linnæus) Correa is cultivated in India for its edible fruit, the rind of which is also medicinal.

The North American genera containing trees are:

Fruit dry, a capsule or a samara.

Fruit a dehiscent capsule.

Fruit an indehiscent samara.

Fruit separating into 3 or 4 carpels, which are winged on the back; filaments glabrous.

Fruit winged all around; filaments hairy.

Fruit pulpy, a drupe or berry.

Fruit a small drupe; stamens 8.

Fruit a large berry; stamens 20 to 60.

1. *Xanthoxylum*.

2. *Helietta*.

3. *Ptelea*.

4. *Amyris*.

5. *Citrus*

I. THE PRICKLY ASHES

GENUS **XANTHOXYLUM** LINNÆUS

XANTHOXYLUM (Greek, Yellow wood) includes not fewer than 140 species, all woody plants and many of them trees, widely distributed in tropical regions, a few in the temperate zones; the type is *Xanthoxylum Clava-Herculis* Linnæus. Their foliage is aromatic and the bark is usually armed with spines supported on conic cushions of cork. The leaves are alternate and pinnately compound in all our species. The flower-clusters are either terminal or axillary and the flowers perfect or usually imperfect; they have 4 or 5 sepals, petals and stamens, and the pistil is composed of from 1 to 4 carpels, more or less united, which ripen into capsules each containing one seed.

Flower-clusters small, dense, axillary.

Flower-clusters large, terminal.

Leaves unequally pinnate, dull.

Not prickly; leaves persistent.

Very prickly; leaves deciduous.

Leaves equally pinnate, shining.

1. *X. Fagara*.

2. *X. flavum*.

3. *X. Clava-Herculis*.

4. *X. coriaceum*.



FIG. 523. — Wild Lime.

1. **WILD LIME** — ***Xanthoxylum Fagara***
(Linnæus) Sargent

Schinus Fagara Linnæus. *Fagara Fagara*
Small

Usually a shrub, the Wild lime, occasionally forms a tree about 10 meters high. It grows plentifully in southern Florida, along the Gulf coast in Texas, is very abundant throughout the Bahamas and occurs also through the West Indies to Central and South America, being one of the most widely distributed of tropical woody plants.

The bark is gray and thin and bears corky projections 2.5 cm. high or less; the branches are usually plentifully armed with hooked prickles, making passage through

thickets usually impossible without cutting one's way, though the plant is occasionally nearly or quite unarmed; the twigs are smooth, gray-brown, often somewhat zigzag. The evergreen leaves are unequally pinnate, 6 to 10 cm. long, with from 5 to 11 sessile leaflets, the axis winged between the leaflets, and the leaf-stalk, which is from 6 to 12 mm. long, also winged or margined; the leaflets are

obovate, thick, firm in texture, 1 to 2.5 cm. long, notched or rounded at the apex, narrowed or wedge-shaped at the base, bluntly few-toothed or sometimes entire-margined. The small yellowish green flowers are in usually numerous short axillary cymes, and open in Florida from March to June, the staminate on one tree, the pistillate on another; there are 4 small sepals, 4 ovate petals, 4 stamens rather longer than the petals in the staminate flowers, while the pistillate flowers have 2 pistils with slender styles united above, but no stamens. The fruit is an obovoid roughish capsule about 3 mm. long, containing a round black shining seed.

The wood of the Wild lime is very hard and compact, reddish brown, with a specific gravity of about 0.74.

The Northern prickly ash, *Xanthoxylum americanum*, Miller, occurring along river banks and in woods from Québec and Ontario to Georgia and from Minnesota to Nebraska and Missouri, is an aromatic prickly shrub sometimes assuming the form of a tree, rarely 7 meters tall, with a stem up to 2 dm. thick; it resembles the foregoing species in general appearance, its flowers and fruits being in small axillary clusters, but the leaves are larger and deciduous while the flowers are without calyx. This plant furnishes most of the Prickly ash berries of the drug trade, but very little of the bark; its wood is coarse-grained, soft and light brown, with a specific gravity is about 0.56.

2. YELLOW WOOD — *Xanthoxylum flavum* Vahl

Xanthoxylum floridanum Nuttall. *Fagara flava* (Vahl) Krug and Urban

Xanthoxylum caribæum S. Watson, not Lamarck

The Satinwood, as it is also called, is an unarmed, evergreen, round-topped tree or shrub of the Florida Keys, Bermuda and the Bahamas, southward to Jamaica and Martinique. It attains a maximum height of about 10 meters, with a trunk up to 4.5 dm. thick, but is usually much smaller.

The bark is about 6 mm. thick, light gray, shallowly fissured, separating into short, close, scales. The twigs are stout but very brittle, densely silky hairy at first, gradually becoming smooth or nearly so and bearing large rounded leaf scars; the winter buds are about 12 mm. long, taper-pointed and hairy. The leaves are unequally pinnate, 1 to 2 dm. long, including the round stout glandular petiole; the 5 to 11 leaflets are oblong or ovate,



FIG. 524. — Yellow Wood.

3.5 to 7 cm. long, short-stalked, blunt or pointed at the apex, nearly entire or slightly scalloped on the margin, unequal at the base; they are covered with stellate



FIG. 525. — Yellow Wood, Inagua, Bahamas.

hairs when young, becoming thick, leathery and smooth, dull yellowish green, with numerous large glands. The dioecious flowers, which appear in Florida during June, in Bermuda in September, are in panicles of small cymes, the pedicels and bracts whitish-hairy; calyx about 1 mm. broad, its sepals triangular-ovate; petals 5, oblong or oblong-ovate, 2.5 mm. long, greenish-white, recurved and thickened; stamens longer than the petals; ovary glandular-punctate. The fruit is an ovoid capsule 6 mm. long, also glandular-punctate, containing a single seed which is about 4 mm. long, black and shining.

The wood is very hard but weak and brittle, fine-grained, orange-yellow and susceptible of a fine polish; its specific gravity is about 0.90; it is largely used for furniture, and for tool handles.

3. SOUTHERN PRICKLY ASH — *Xanthoxylum Clava-Herculis* Linnaeus

Xanthoxylum carolinianum Lamarek. *Fagara Clava-Herculis* Small

This very spiny tree or shrub occurs most abundantly near the coast from Virginia to Florida, extending westward into Texas, and north to Arkansas, attaining a height of 17 meters, with a trunk diameter up to 5 dm. It is also known as Toothache tree, Pepperwood and Hercules' club.

The trunk is rather stout, the branches numerous and outspreading, forming a round head. The bark is about 2 mm. thick, light gray with numerous broad

and corky based conic prickles often over 5 cm. in diameter. The twigs are brown-hairy at first, becoming smooth, gray, and bear stout, sharp, brown broad-based prickles about 2 cm. long. The winter buds are short and blunt, dark brown. The leaves are deciduous, unequally pinnate, 2 to 3 dm. long, including the stout, often prickly stalk; leaflets 7 to 19, rarely as few as 3, ovate to lanceolate, 3 to 7 cm. long, short-stalked or sessile, taper-pointed, shallowly toothed, abruptly narrowed at the base, the lateral ones unequal and sometimes curved; they are bright green and shining above, paler and sometimes slightly hairy beneath. The flowers, appearing in the spring, are dioecious, in cymose panicles 1 to 2 dm. long, their calyx about 1 mm. long; petals 3 mm. long, concave, thickened and blunt at the apex; stamens longer than the petals, their filaments smooth. The fruit is in dense clusters, the capsules obliquely globose-obovoid, 5 to 6 mm. in diameter, rough, minutely tipped and brown; seed black, shining.



FIG. 526. — Southern Prickly Ash.

The wood is rather soft, close-grained and light brown; its specific gravity is about 0.50. The bark, together with that of the Northern prickly ash, *Xanthoxylum americanum* Miller, is official in the United States Pharmacopœia under the name of *Xanthoxylum*, but most of that found in commerce is obtained from this southern species.

4. DOCTOR'S CLUB — *Xanthoxylum coriaceum* A. Richard

Tobinia emarginata Grisebach. *Fagara coriacea* Krug and Urban

Also called Hercules' Club, this is a spiny shrub or small tree growing in southern peninsular Florida and the adjacent Keys, the Bahamas and many other islands of the West Indies. It reaches a maximum height of about 7 meters, but is usually much smaller.

The trunk is usually fluted at the base, and like the branches, is usually armed with broad corky-based spines. The bark is very thin and close, brownish gray with lighter blotches. The twigs are quite smooth and dark brown. The leaves are also smooth, equally pinnate, 1 to 2 dm. long, including the smooth or rarely prickly stalk with a slightly enlarged base; the 4 to 12 leaflets are in oppo-

site pairs, thick and leathery, obovate to wedge-shaped or oblong, 3.5 to 6 cm.



FIG. 527. — Doctor's Club.

long, rounded or notched at the apex, more or less revolute on the entire margin, tapering at the base into a short stout stalk, prominently reticulated on both surfaces, bright green and shining above, paler beneath. The flowers are in corymb-like cymes, their stout pedicels sometimes slightly hairy; the small calyx consists of 3 broad blunt sepals each about 0.5 mm. long; petals also 3, yellowish, oval or oblong, 2 to 3 mm. long; stamens 3, their anthers shorter than the filaments. The ovoid capsules are 4 to 5 mm. long, rough-glandular and brown;

seed black, shining and punctate.

The wood is hard, close-grained, grayish yellow and heavy.

II. BARETTA

GENUS *HELIETTA* TULASNE

Species *Helietta parviflora* Bentham



SMOOTH evergreen shrub occurring on the bluffs about Rio Grande, Texas, and southward into Mexico, where it becomes a tree 8 meters high, with a trunk diameter of 1.5 dm.

It is perhaps never more than a shrub in Texas.

The trunk is erect and slender, its branches also erect, or nearly so. The bark is 3 mm. thick, dark brown, scaly, the inner bark yellowish. The twigs are round, slightly hairy, becoming smooth, brown, the small leaf scars roundish. The leaves are opposite, trifoliate, the 3 leaflets sessile on the grooved leaf-stalk; the leaflets are leathery, spatulate to obovate or ob-



FIG. 528. — Baretta.

long, 1 to 4 cm. long, blunt or notched at the apex, tapering to the sessile base, usually entire, the terminal one usually largest; they are yellowish green and shin-

ing above, paler beneath and abundantly black glandular-punctate. The perfect flowers appear in April or May in finely hairy paniced cymes 2 to 5 cm. long, axillary to the upper leaves. The calyx consists of 4 ovate, sharp-pointed sepals, united at the base; the 4 petals are white, thick, oblong, 2.5 mm. long, blunt and slightly crisped and spreading; stamens 4, shorter than the petals, their filaments flattened and smooth; disk, ovary and style glandular-punctate, the 4-lobed ovary depressed-ovoid. The samaras are in clusters of 3 or 4, oblong, 6 to 8 mm. long, their wings ovate, rounded, 6 to 12 mm. long and netted-veined.

The wood is hard, close-grained, orange to brown; its specific gravity is about 0.88; it is used for fuel.

The genus consists of about 4 species, all American, occurring from Texas to Paraguay, the type being *H. Plaana* Tulasne of Colombia. The name is in commemoration of Dr. Louis Theodore Hélie, a French physician.

III. THE HOP TREES

GENUS **PTELEA** LINNÆUS



THIS wholly American genus, occurring from Canada to southern Mexico, contains about 12 distinct species of shrubs or low trees of no special economic value, though many more have been described.

They have alternate, rarely opposite, 3- to 5-foliolate leaves without stipules. The polygamous flowers are greenish or yellowish on slender pedicels, in terminal often compound cymes. The calyx is deeply divided into 3 to 5 lobes; petals 3 to 5, imbricated, longer than the calyx, spreading and deciduous; stamens equal to the petals in number and alternate with them, their anthers ovate, sometimes cordate, introrse, 2-celled and opening longitudinally; in the fertile flowers, however, the stamens are shorter, with imperfect anthers; ovary 2- or 3-celled; style very short; stigma 2- or 3-lobed; ovules 2 in each cavity, one above the other, the upper one only becoming fertilized. Fruit a 2-celled, 2-seeded samara, orbicular or nearly so, with a broad reticulated wing; seed with a smooth or slightly wrinkled leathery coating, and fleshy endosperm.

The generic name is the ancient Greek name of the Ash, which the fruit was thought to resemble; *Ptelea trifoliata* is the type species.

Two of the species occurring in our area become arborescent.

Leaflets 10 to 15 cm. long, usually acuminate; fruit about 25 mm. across; eastern.

1. *P. trifoliata*.

Leaflets 2.5 to 7.5 cm. long, usually blunt at the apex; fruit 18 mm. across; Californian.

2. *P. crenulata*.

1. THREE-LEAVED HOP-TREE — *Ptelea trifoliata* Linnæus

Occurring from Ontario to Florida, Minnesota, Kansas and Texas as a well-known shrub under various names, such as Shubby trefoil, Whahoo, Quinine tree, Sang tree, Hop ash, Stinking ash, Water ash, Wafer ash, and Wing seed, this rarely becomes a tree 7.5 meters tall, with a trunk diameter of 2 dm. It has a rather disagreeable odor.



FIG. 529. — Three-leaved Hop Tree.

The trunk is slender, the branches spreading, forming a round top. The bark is about 3 mm. thick, smooth or nearly so and dark gray. The twigs are slender, finely hairy when young, soon becoming smooth, shining, dark brown and marked by prominent leaf scars. The winter buds are very small, nearly round and whitish. The leaves are 3-foliolate with a petiole 6 to 7.5 cm. long; leaflets sessile, ovate or elliptic-oblong, 1 to 1.5 dm. long, usually taper-pointed, rounded or narrowed at the base, mostly entire on the margin,

the terminal one largest and more gradually tapering toward the base; they are hairy when unfolding, smooth at maturity and dark green and somewhat shining above, paler, smooth or hairy and prominently veined beneath. The flowers appear from March to June, according to latitude, the sterile and fertile flowers borne in the same clusters, their pedicels slender, very hairy or nearly smooth; petals ovate-oblong, 3 to 5 mm. long; ovary slightly hairy. The fruit is about 2.5 cm. in diameter, rounded or notched at the base, hanging on the slender pedicels and persisting well into the winter.

The wood is hard, close-grained, yellowish brown and satiny; its specific gravity is about 0.83. The bark of the root is sparingly used as a bitter tonic and the ripe fruit is said to be used as a substitute for hops. The plant is often seen in cultivation, where its bright foliage and buff-colored fruits add pleasing variety to the shrubbery.

2. CALIFORNIA HOP TREE — *Ptelea crenulata* Greene

A small Californian tree of the coast mountains and the western foothills of the Sierra Nevada, attaining a height of 7.5 meters though usually much smaller and often a shrub. Its odor is quite agreeably aromatic.

The round twigs are hairy, becoming smooth and dark brown. The winter-

buds are small, and white hairy. The leaflets are sessile, elliptic to obovate, 2.5 to 7.5 cm. long, usually blunt, sometimes sharp-pointed, rounded or broadly wedge-shaped at the base and margined with small round teeth, bright green and smooth above, paler and somewhat hairy beneath; the slender leaf-stalk is from 2 to 4 cm. long. The flowers which appear from April to June, are small, greenish, the petals 2 or 3 times as long as the calyx, about 6 mm. long, the filaments hairy at the base. The fruit is about 18 mm. in diameter, almost circular; the wing rounded or notched, rarely somewhat heart-shaped at the base.



FIG. 530. — California Hop Tree.

IV. THE TORCHWOODS

GENUS **AMYRIS** LINNÆUS



AMYRIS comprises about 15 species of unarmed trees or shrubs of tropical America. They abound in fragrant resinous substances, and have been used as aromatics and stimulants.

They have either alternate or opposite, usually compound leaves which are conspicuously glandular-punctate. The flowers are perfect or polygamous, white, and borne in terminal or axillary panicles. The calyx is urnshaped and 4-lobed; the 4 petals are imbricated; stamens 8, inserted on the disk, their filaments exserted; anthers ovate, introrse and opening lengthwise; ovary 1-celled, rudimentary or sterile in the staminate flowers; style terminal, short or none; stigma capitate; ovules 2, suspended from the top of the cavity. The fruit is an aromatic, ovoid or obovoid drupe with a papery stone which is one-seeded; seed pendulous, without endosperm; the embryo is small.

The name is Greek in allusion to their aromatic or balsamic properties; the type species is *A. elemifera*. In addition to the arborescent species a shrub, *Amyris parvifolia* A. Gray, occurs on our Mexican border.

Leaflets shining beneath; ovary smooth; fruit globose.

Leaflets dull beneath; ovary hairy; fruit obovoid to oval-elliptic.

1. *A. elemifera*.

2. *A. balsamifera*.

1. TORCHWOOD — *Amyris elemifera* Linnaeus*Amyris maritima* Jacquin

This is a slender evergreen tree or shrub of sandy and rocky soil in southern peninsular Florida and the Keys, the Bahamas and most of the other West Indies. It attains a maximum height of about 17 meters, with a trunk diameter of 3 dm.

The bark is thin, slightly fissured and broken into small grayish scales. The twigs are slender, round, brown, becoming gray. The winter buds are flattened,



FIG. 531. — Torchwood.

sharp-pointed, about 3 mm. long. The leaves are 3- to 5-foliate, on slender stalks 2.5 to 4 cm. long, slightly thickened toward the base; the leaflets are broadly ovate, blunt, sharp or taper-pointed, wedge-shaped or rounded at the base, entire or remotely round-toothed on the margin. They are thick, dark green and shining on either side, prominently veined and black glandular-dotted beneath, 2.5 to 8 cm. long, the terminal leaflet often longer than the lateral ones. The flower clusters are smooth, terminal, pedunculate or nearly sessile; they appear throughout the year, but are most abundant in August and September. The fruit is globose, about 10 mm. long; the fleshy outer covering is black and covered with a glaucous bloom; when fully ripe it is of an aromatic, oily and rather agreeable flavor.

Torchwood is hard, close-grained, very resinous, orange-colored; its specific gravity is about 1.04. It is very durable, takes a fine polish, but in Florida it is used only for fuel. The branches are used for torches in the West Indies.

2. BALSAM TORCHWOOD — *Amyris balsamifera* Linnaeus

A small tree or shrub of sandy or rocky soils of southern Florida, the West Indies and South America, attaining a height of 7 meters, with a trunk diameter of about 2 dm. It is sometimes called Rosewood and Candle-wood.

The twigs are slightly hairy, slender and dark gray, the leaves 3- to 5-foliate on slender petioles; the leaflets are ovate to ovate-lanceolate, 5 to 13 cm. long, taper-pointed, narrowed or rounded at the base, entire or crenulate on the mar-

gin, each on a short stalk, thick and leathery, bright green, smooth and shining above, dull green and conspicuously veined and black glandular dotted beneath. The flowers appear throughout the year in panicles 3 to 8 cm. long, on short slightly hairy pedicels; the obovate or oval petals are 3 to 3.5 mm. long; the ovoid or ellipsoid ovary is hairy. The fruit is obovoid to elliptic-oval, 6 to 13 mm. long, tapering below into a short neck, black with a bluish bloom when fully ripe, and aromatic.

The wood is similar to that of the preceding species, and its branches are also used for torches.



FIG. 532. — Balsam Torchwood.

V. CITRUS FRUITS

GENUS **CITRUS** LINNÆUS



CITRUS consists of about 30 species of usually thorny evergreen trees or shrubs of Asiatic origin, many of which are cultivated throughout the tropics for their delicious acidulous fruits and have become abundantly naturalized in many warm countries. Their economic importance lies in their valuable fruits. The volatile oil contained in the abundant small oil-glands, especially in the rind of the fruit, is largely used for flavoring, and the more acid fruits are a source of that most important of vegetable acids, citric acid. The wood of the orange tree is used to some extent in fancy cabinet work and for canes.

Several of the lesser known fruits of this genus have become popular with us. Foremost among these is the Grape fruit, a form of *Citrus decumana* Linnæus, also commonly known as Pomelo; this species is a native of the Malay region and is a large tree noteworthy for its immense grape-like clusters of large, nearly globular, light yellow fruits often 1 dm. or more in diameter, the flesh of which has a peculiarly blended taste of bitter, sweet and acid, making it a most healthful breakfast food. The Mandarine, a depressed-globose fruit of the size of a small orange with a deep orange-colored or almost red, very smooth, thin rind and a sweet pleasantly acid pulp, is the product of a small tree native of Cochin China, *Citrus nobilis* Louriero. The small, berry-like, light yellow fruits, 12 to 18 mm. long, known as Kumquats and noted for their spicy sweet acid taste, are quite rare in

our markets but are eagerly sought for by those who know them; they are produced by a small Japanese tree, *Citrus madurensis* (Rumpf) Louriero. All these fruits are being successfully grown in California, Florida, and the West Indies. The Trifoliolate orange, *Citrus trifoliata* Linnæus, native of Japan, is noted for its hardiness, thriving as far north as southern New York; it is a popular hedge plant southward; its small fruits are pleasing to look upon, but worthless as food on account of their bitter pungent taste; expert horticulturists, however, are working with it in the hope of securing hybrids with the more useful species which will prove both hardy and edible. Oil of Bergamot is the volatile oil of the rind of the fruit of *C. Bergamia* Risso and Poiteau.

Citrus trees have alternate, persistent, leathery, usually unifoliolately compound leaves, the blade falling away from the petiole or rachis, which is often winged. The flowers are perfect and regular, very fragrant, solitary or in few-flowered clusters in the axils of the leaves; calyx cup-like, 4- or 5-toothed; petals 5; rarely 4 to 8, usually white, and deciduous; stamens 20, rarely as many as 60, inserted around the annular or cup-like disk, their filaments dilated at the base and often united into clusters; anthers versatile; ovary superior, several-celled; ovules several in each cavity; styles united, deciduous. The fruit is a variously shaped large or small berry, with an acidulous juicy pulp and a tough leathery rind which contains numerous glands filled with pleasantly aromatic volatile oil; seeds several in each cell, reduced in number or often wanting in the cultivated varieties, with a pale yellow papery coating and large fleshy cotyledons; there is no endosperm.

The name is the Greek name of the Citron which is the type of the genus.

The following species have become naturalized or frequently appear spontaneously in the warmer portions of our area:

Leaf-stalk margined or winged.

Wings very broad.

1. *C. vulgaris*.

Wings very narrow or mere margins.

Leaflet entire; fruit with a sweet pulp and an easily separable rind.

2. *C. Aurantium*.

Leaflet toothed; fruit with a very acid pulp and an inseparable rind.

3. *C. Limonum*.

Leaf-stalk usually without margins or wings.

Berry small with a thin rind.

4. *C. spinosissima*.

Berry large with a thick fleshy rind.

5. *C. medica*.

1. BITTER ORANGE — *Citrus vulgaris* Risso

Also called Sour orange, and Bigarade orange, this is a small tree with a compact head, reaching a maximum height of 9 meters, with a trunk up to 4 dm. thick.

The twigs are light green and smooth, the thorns small, alternate and sharp-pointed, larger and stronger on older branches. The leaf-blades are borne on very broad-winged petioles 12 to 18 mm. long. The blades are ovate, 7.5 to 10 cm. long, sharp-pointed, entire on the margin, dark green, shining and very aromatic. The flowers are about 3 cm. broad, in axillary cymes. Calyx cup-shaped, the 4 or 5 lobes blunt-pointed; petals linear-oblong, white, containing numerous conspicu-

ous oil-glands; stamens 20 to 25, their filaments united into several groups; ovary 6- to 14-celled. The fruit is globose, its rind quite reddish, slightly rough with a great profusion of oil-glands, the whitish internal portion spongy and very bitter; flesh acid and bitter; seeds rather small, flattened and somewhat cone-shaped, longitudinally ridged.

The Bitter orange is a native of southeastern Asia. The fruits of some sorts are eaten, and made into preserves. The juice is used, as is that of the Lemon, to form a refreshing drink called orangeade. The dried rind is largely used in medicine for its bitter tonic properties and to impart its flavor to preparations of other drugs; the dried young fruit, under the name of Orange berries, is similarly used. The volatile oil obtained from the flowers

is a popular flavor and basis for perfume; it is known as oil of neroli, while the volatile oil, preferably obtained by mechanical methods from the rind of this fruit, is considered superior to that similarly derived from the Sweet orange.

The seedlings of this species are a favorite stock upon which to graft the improved varieties of other Citrus fruits.



FIG. 533. — Bitter Orange.

2. SWEET ORANGE — *Citrus Aurantium* Linnæus



FIG. 534. — Sweet Orange.

This, one of the most popular of all fruits, is widely cultivated in all tropical countries and has become spontaneous in peninsular Florida and in other Gulf States and perhaps in California; it is the largest of our species, often attaining a height of 12 meters.

The branches form a compact, broad head, and bear but few thorns. The bark is thin, rather smooth and grayish brown. The leaves have narrow-margined leaf-stalks about 2.5 cm. long; their blades are oval to ovate-oblong, 7.5 to 10 cm. long, sharp-pointed, rounded at the base, usually entire on the margin, dark green and shining above, paler beneath. The flowers are



FIG. 535. — Lemon, Montserrat, West Indies.

in clusters of 1 to 5, rather smaller than those of the preceding species; their calyx is cup-shaped with 4 to 6 persistent, awl-shaped, thick, green lobes; petals usually 5, oblong, 12 to 18 mm. long, thick, fleshy and recurved; stamens 20 to 25, included, their filaments flattened and united into several groups; ovary rounded, 10- to 14-celled; stigma capitate. The fruit is globose or slightly depressed; rind smooth, orange colored and easily separable from the juicy, sweet, subacid pulp; seeds few or many, in some cultivated varieties entirely wanting, oblong-ovoid, usually flattened, pointed at one end and obliquely ridged.

The Sweet orange is probably a native of southeastern China. The wood is quite hard, close-grained and light yellow.

3. LEMON — *Citrus Limonum* Risso

In Florida the lemon was growing wild long before any attempt had been made toward its cultivation by American settlers, and it was probably introduced during the early Spanish occupation. It is a small tree up to 6 meters tall.

The branches are somewhat spreading, short and thorny, forming a rather open head. The bark is thin, rather smooth and grayish. The twigs are smooth, purplish at first, becoming yellowish gray. The leaf-blades are borne on narrowly margined petioles; they are light green, ovate-oval, 5 to 7 cm. long, sharp-pointed, rounded at the base, toothed on the margin. The flowers are solitary or in pairs in the axils of the leaves, on short peduncles; the persistent calyx is 4- or 5-lobed; the corolla is 4 to 5 cm. across, purplish outside, white within; the oblong petals are rounded at the apex and spreading; stamens about 35, their filaments more or less united into small groups; ovary 7- to 10-celled. The fruit, ripening at all seasons, is oblong or ovoid, usually about 7.5 cm. long, pointed at each end; its rind is light yellow, quite thin, very aromatic, varying from nearly smooth to very rough or mamillated, and adherent to the abundant, white, very juicy, acid pulp; seeds oval, pointed and quite smooth.



FIG. 536. — Lemon.

The Lemon is probably a native of Cochin China and is widely cultivated in tropical countries. In the United States, where its consumption for lemonade is enormous, it is cultivated in California and in Florida, but the bulk of the supply still comes from the Mediterranean region.



FIG. 537. — Lime.

4. LIME — *Citrus spinosissima* Meyer

A small straggling tree or shrub attaining a maximum height of 6 meters; it has become sparingly naturalized in peninsular Florida, where it is being cultivated to some extent.

The trunk is usually very short. The branches are crooked, numerous and very thorny; the thorns are small, but sharp, the twigs light green, becoming darker

with age. The leaves, which usually have wingless petioles, are dark green and shining, elliptic-oval, often bluntish at each end, wavy or slightly toothed on the margin. The flowers are in axillary clusters of 3 to 10, the calyx 4- or 5-toothed; corolla white throughout; the 4 or 5 petals are oblong and rather fleshy; stamens about 25, small, their filaments united into several groups; ovary short, about 10-celled. The fruit is usually short-oval, about 4 cm in diameter, the rind light yellow, rather thin, often roughened; flesh greenish, very juicy and acid.

The Lime is a native of India and southeastern Asia, but has been cultivated in tropical countries for a long period, the fruit being of much importance as the basis of cooling acidulous drinks.

5. CITRON — *Citrus medica* Linnæus

The Citron is sparingly cultivated and occasionally spontaneous in peninsular Florida. It is usually a shrub, rarely becoming a small tree 4 meters tall.

The trunk is short; the branches are thick, irregular, rather straggling and very thorny, the bark thin and light gray. The twigs are stiff, smooth and purplish at first. The leaves have wingless petioles, are oval-oblong, 1 to 1.5 dm. long, sharp-pointed, toothed or usually entire, dark dull green above, paler beneath. The flowers are rather large in compact axillary clusters of 3 to 10, often imperfect; calyx cup-shaped; corolla tinged with purple outside, white within, the petals oblong, their apex incurved; stamens about 40, included; ovary 9-to 12-celled. The fruit is oblong, 1.5 to 2 dm. long, blunt at the apex; rind very thick, roughened and light yellow externally, white

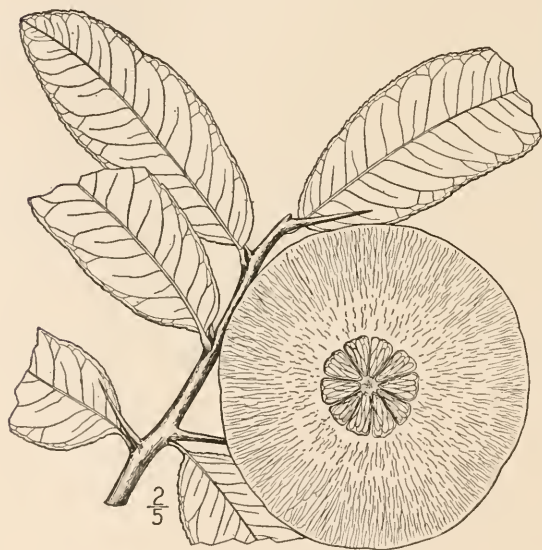


FIG. 538. — Citron.

and fleshy inside, the pulp very juicy, acid and bitterish or sweetish; seeds oval, nearly white and smooth.

The Citron, which is the most tender of the species grown in America, is probably a native of eastern China and has been in cultivation for a very long time. It is used almost exclusively as candied rind, very little of which is produced in either Florida or California; most of our supply is secured, by importation from Italy, of the rind preserved in salt solution, from which it is freed and then candied in this country.

THE QUASSIA FAMILY

FAMILY SIMAROUBACEÆ de Candolle



THE Quassia Family consists of nearly 30 genera, including about 150 species of trees and shrubs, together with a few herbaceous plants, widely distributed in warm and tropical regions of both the Old World and the New, a few only inhabiting the temperate zones. They have a bitter sap, which is usually milky, and most of them have pinnate leaves without stipules. Their flowers are mostly diœcious or polygamous, small, regular and in axillary or terminal clusters. The calyx is 3-lobed to 5-lobed, or of 3 to 5 persistent sepals; the disk of the flower is well developed, usually ring-like or cup-like; there are from 3 to 5 deciduous petals and as many or twice as many stamens in the staminate flowers with separate filaments and introrse anthers; the pistillate flowers have 2 to 5 pistils which are more or less united, their ovaries sometimes completely united; each cavity or separate ovary usually contains one pendulous ovule; there are also commonly several abortive filaments or staminodes in the pistillate flowers. The fruit is a drupe, berry, capsule or samara in the different genera.

The bitter principle pervading most members of this family has caused the bark or wood of many of the species to be employed as tonic and febrifuge remedies; the most generally used is Quassia, the wood of *Picraena excelsa* (Swartz) Planchon, of Jamaica, and that of *Quassia amara* Linnæus, of Guiana. It is usually found in the shops as chips; drinking cups turned out of the wood exhibit its persistent bitterness, water placed in them for a few moments becoming intensely bitter, forming a very convenient way to secure its tonic properties, which they continue to supply for a considerable time. An infusion of the chips, sweetened with sugar is used to poison flies.

The North American trees of this family are species of the following genera; all have pinnately compound leaves.

Fruit a drupe or berry.

Ovary deeply lobed; fruit drupaceous.

1. *Simarouba*.

Ovary not lobed, 2-celled to 5-celled; fruit a berry.

2. *Picramnia*.

Fruit a samara or winged capsule.

Petals 5 or 6; fruit a samara; introduced Asiatic tree.

3. *Ailanthus*.

Petals none; fruit a hairy, winged capsule; native tree of southern Florida.

4. *Alvaradoa*.

I. GUMBO LIMBO

GENUS **SIMAROUBA** AUBLETSpecies ***Simarouba medicinalis*** Endlicher

SIMAROUBA (the name aboriginal for the type species, *S. amara* Aublet in Guiana) includes some 10 species of resinous evergreen trees with alternate odd-pinnate leaves, natives of tropical and subtropical America. Their small flowers are numerous in large panicles, the pistillate ones succeeded by small drupes.

Gumbo Limbo, known also as Bitter-wood, Paradise tree, and on the Bahama islands as Ash, inhabits southern Florida, the Bahamas and Jamaica, and probably occurs also on Cuba; it has been confused, however, with the similar Cuban *Simarouba glauca* de Candolle. It attains a maximum height of about 17 meters, with a trunk up to 5 dm. in diameter.



FIG. 539. — Gumbo Limbo.

The bark is thick, reddish brown and somewhat scaly; the young twigs are green and smooth, turning reddish brown. The leaves are 3 dm. long or less, composed of about 13 leaflets or fewer, the leaf-axis slender and round, the leaf-stalk long; the leaflets are oblong to oblong-obovate, leathery in texture, 4 to 8 cm. long, blunt or bluntly pointed, entire-margined, very bright green and strongly shining on the upper side, pale and dull beneath, smooth or with some minute hairs, the two surfaces

contrasting very strongly in color and luster. The panicles of flowers are often as long as the leaves, the flowers borne 2 to 6 together or singly along the branches on very short stalks; the flowers are about 10 mm. broad when expanded and have 5 very short ovate sepals and 5 ovate to oblong-lanceolate yellowish petals; the staminate ones have 10 stamens, each with a toothed scale at the base of the filament; the pistillate ones have a deeply 5-lobed ovary with 5 recurved styles, which ripens into 5 or fewer red or purple oval drupes about 2 cm. long.

The bark yields a bitter tonic. The wood is soft, brownish, and of little value; its specific gravity is about 0.40.

II. BITTER BUSH

GENUS **PICRAMNIA** SWARTZSpecies **Picramnia pentandra** Swartz

WEST INDIAN shrub or small tree which enters our area in southern peninsular Florida and some of the Keys, where it occurs in sandy soils and reaches a maximum height of 6 meters, with a trunk diameter of 1.5 dm. It is abundant on the Bahama islands and in Porto Rico and other West Indian islands.

The twigs are slender, slightly hairy and gray. The alternate leaves are 1 to 3 dm. long, unevenly pinnate, consisting of 5 to 9 leaflets and a round leaf-stalk 4 to 6 cm. long; the leaflets are elliptic or oblong-elliptic, rarely ovate, 5 to 10 cm. long, taper-pointed, tapering or rounded at the base, entire on the thickened margin, thin and firm, dark green and shining above, paler and smooth beneath, the venation yellowish and conspicuous on either side. The flowers are diœcious, greenish and small, in rather loose, few-flowered, slightly hairy panicles opposite the leaves; the calyx is usually 5-lobed and the lobes imbricated, those of the pistillate flowers narrowly triangular-ovate and sharp-pointed, the disk flat and lobed; the corolla of the staminate flowers is 3 to 5 mm. wide, the petals narrow; stamens usually 5, inserted opposite the petals and beneath the disk; in the pistillate flowers they are reduced to linear scales; the ovary is sessile, 2-celled; styles partially united; stigmas 2 or 3, recurved; ovules 2, pendulous. The fruit is an oblong berry, 1 to 1.5 cm. long, reddish, becoming dark blue or black and shining.



FIG. 540. — Bitter Bush.

The genus is tropical American, comprising about 30 species of trees or shrubs with a very bitter principle in their bark, wood and twigs, to which the Greek generic name has reference. The type species is *Picramnia Antidesma* Swartz, of the West Indies and Central America.



FIG. 541. — Tree of Heaven, New York Botanical Garden.

III. TREE OF HEAVEN

GENUS **AILANTHUS** DESFONTAINESSpecies ***Ailanthus glandulosa*** Desfontaines

S EVEN species of *Ailanthus* are known, all natives of eastern Asia; they are trees with odd-pinnate leaves and large panicles of small greenish-white flowers, the pistillate ones followed by drooping clusters of narrow samaras. The generic name is modified from an Asiatic name of this tree.

Ailanthus glandulosa, which is the generic type, is a native of China, known also as Chinese sumac, but has become so perfectly established in parts of the northeastern United States and Ontario as to appear like an element of the natural flora, growing not only along roads and near habitations, but often in woods and wild thickets, spreading freely both by suckers and seeds. It sometimes becomes 30 meters high, with a trunk up to a meter in diameter.

The bark is thin, gray, slightly roughened, that of young branches and shoots quite smooth. The leaves are from 3 to 10 dm. long, stalked, smooth, with 13 to 41 short-stalked pointed leaflets, which are ovate to ovate-lanceolate, entire-margined or with 1 to 4 blunt teeth near the heart-shaped or truncate base, thin in texture and wilting at once after the leaf is picked. The individual flowers are only about 6 mm. broad, but



FIG. 542. — Tree of Heaven.

exceedingly numerous; the calyx is 5-lobed, the petals 5, valvate, spreading, the disk 10-lobed, and the unpleasantly scented staminate ones have 10 stamens; the ovary in the pistillate ones is deeply 2-lobed to 5-lobed. The samaras are linear, veiny, twisted, about 5 cm. long, thin, bearing the seed at about the middle.

The free growth by suckers makes this a weed-tree, often very difficult to eradicate, coming up year after year even when ruthlessly cut down, and growing 2 or 3 meters high in a season. The wood is nearly white, soft and weak.

IV. ALVARADOA

GENUS **ALVARADOA** LIEBMANNSpecies ***Alvaradoa amorphoides*** Liebmann

ALVARADOA consists of four species, natives of the West Indies, and Mexico, one of them occurring in southern Florida. They have alternate pinnate leaves with numerous small alternate leaflets readily detachable from the leaf-axis when dry. The small regular diœcious flowers are in racemes or spikes. The name is in honor of Pedro de Alvarado, a Mexican explorer and conqueror, who assisted Cortes in the conquest of Mexico.

In *Alvaradoa amorphoides*, the twigs and racemes are finely velvety. The

FIG. 543. — *Alvaradoa*.

leaves are 2 dm. long or less, including the slender stalk, and usually have 25 to 35 leaflets, which are short-stalked, thin, obovate to oblong, 2 to 3 cm. long, 7 to 10 mm. wide, finely hairy on both sides, or the upper surface smooth when old, dark green above, pale or whitish beneath, the apex rounded or pointed, the base narrowed. The slender racemes of flowers are borne at the ends of branches, those of staminate flowers sometimes 4 dm. long, those of pistillate flowers shorter; the calyx is about 1.5 mm. long, velvety, deeply 5-lobed, its lobes ovate, acutish; there are no petals; the staminate flowers have 5 stamens with filiform filaments

several times longer than the calyx, and a 5-lobed disk; the pistillate flowers have a similar calyx, and a flattened ovary with 2 or 3 recurved styles; the ovary is 2-celled or 3-celled, the 2 ovules being borne in one of the cavities, the other cavity empty. The capsules are lanceolate or ovate-lanceolate, flat, finely hairy and hairy-fringed, 8 to 18 mm. long, 3 to 4 mm. wide, tipped by the persistent styles.

The tree was discovered in southern Florida by P. H. Rolfs and N. L. Britton in 1904, in hammocks southwest of Cutler, and has since been observed by J. K. Small in the same region, attaining a height of 6 meters, with a trunk up to 1 dm. thick. It is widely distributed in the Bahamas, in Cuba and in southern Mexico, growing more commonly as a shrub than as a tree and is the type of the genus.

BAY CEDAR FAMILY

SURIANACEÆ Lindley

Genus *Suriana* Linnæus

Species *Suriana maritima* Linnæus



THE Bay cedar, *Suriana maritima* Linnæus, a typical maritime plant of sea-beaches and coastal rocks, occurs in southern Florida, throughout the West Indies, in northern South America and on islands of the Pacific Ocean. It is named in honor of Jos. Donat Surian, a French artist, and is a monotype, no other species of *Suriana* being known, and it has no close relatives. While usually a mere shrub, 2 meters high or less, it occasionally forms a tree up to 8 meters high, with a single trunk 3 dm. in diameter as observed by J. K. Small on Elliott's Key, Florida.

The bark is brown, rough and irregularly fissured, rather thin, separating finally in thin plates. Its rather thick but flaccid leaves are linear-spatulate, 1.5 to 4 cm. long, finely appressed-silky, entire-margined, alternate, densely set on the twigs, their veins very inconspicuous. The perfect and regular flowers are in small clusters almost concealed by the upper leaves; there are 5 ovate pointed sepals 6 to 8 mm. long, 5 imbricated clawed yellow petals about as long as the sepals, 10 stamens, those opposite the sepals shorter than those opposite the petals, and 5 hairy pistils, each with a one-celled ovary containing 2 ascending ovules, a filiform style and a knob-like stigma. The pistils ripen into hairy achene-like fruits about 4.5 mm. long; the embryo of the seed is horseshoe-shaped.



FIG. 544. — Bay Cedar.

The wood is too meager to be of use for structural purposes, but is very hard and dense and makes good fuel; it is reddish brown in color and very heavy.

THE TORCHWOOD FAMILY

BURSERACEÆ Kunth



BURSERACEÆ consist of about 20 genera, embracing some 200 species of resinous tropical trees, with alternate odd-pinnate leaves, not punctate with pellucid dots. The flowers are small, regular, perfect or diœcious, borne in panicles or racemes. The calyx is composed of from 3 to 6 persistent sepals and the corolla of the same number of separate or sometimes slightly united petals; there is a cup-like or ring-like disk, and the stamens are usually twice as many as the petals, and have separate subulate filaments; the ovary is superior, 2-celled to 5-celled, with 2 pendulous ovules in each cavity, the stigma 2-lobed to 5-lobed. The fruit is rather fleshy and drupe-like, but usually splits into valves when quite ripe, exposing the seed.

There is only one species of tree of this family in our area. The aromatic gummy sap found in practically all of the plants of the family is usually manifested by an exudation on the surface of the bark and twigs, especially when wounded, and this has been largely employed in medicine and the arts. Besides the several kinds that are of general economic importance a great many are known and used only in the localities where they are native. The most important and best known is myrrh, the product of *Commiphora Myrrha* (Nees) Engler, and perhaps several other closely related species, from northeastern Africa; it is a gum-resin and is used as a tonic and stimulant, usually in the form of tincture. The so-called gum elemi, is from *Canarium commune* Linnæus of the Philippine Islands; olibanum or frankincense is obtained from *Boswellia Carterii* Birdwell, and probably other closely related species of the same genus also from northeastern Africa. These and several less known commercial products are used principally in the form of plasters.

WEST INDIAN BIRCH

GENUS **TEREBINTHUS** PATRICK BROWNE

Species **Terebinthus Simaruba** (Linnæus) W. F. Wight

Pistacia Simaruba Linnæus. *Bursera gummiifera* Jacquin. *Bursera Simaruba* Sargent



THE so-called West Indian Birch inhabits southern Florida and is widely distributed throughout the West Indies, occurring also in Central America and northern South America; it is also known as Gumbo Limbo and erroneously as Gum Elemi. The tree attains a height of 20 meters, with a trunk up to 1 meter in diameter, but is usually much smaller;

its lower branches are nearly horizontal and sometimes very close to the ground. It is the type of a genus which consists of some 40 species of trees of tropical distribution.

The thick red-brown smooth and shining bark peels off freely in papery layers of the thickness of those of the Yellow birch. The twigs are stout, smooth, gray, becoming red-brown. The smooth pinnate leaves are clustered toward the ends of the branchlets, are 1 to 2 dm. long, stalked, with from 3 to 7 leaflets, which vary in form from oval to obovate, and are opposite, entire-margined, unequal-sided, firm in texture, short-pointed, 5 cm. long or less. The flowers are in lateral stalked racemes 5 to 10 cm. long, the flower-stalks 4 to 8 mm. long; the sepals, which become reflexed, are ovate and about 1 mm. long; the greenish petals are ovate to oblong-lanceolate, 2 to 2.5 mm. long. The fruits are oblong, bluntly 3-angled, 5 to 6 mm. long, and finally split into 3 valves which fall away from the white seed.



FIG. 545. — West Indian Birch.



FIG. 546. — West Indian Birch, Inagua, Bahamas.

The wood is light brown, weak and soft and decays rapidly; its specific gravity is only 0.30. The branches are much used for fenceposts in the West Indies, and, when fresh, grow readily in such usage into trees, striking root easily. The smooth red-brown bark makes this tree conspicuous in tropical landscapes, and it is considerably planted for shade, being of rapid growth. The generic name *Terebinthus*, referring to the resinous sap, given to this tree by Patrick Browne, in 1756, antedates *Bursera* Jacquin by six years; Browne established the genus by a good description, and by a reference to the Linnæan name of the tree, given in 1753. It is sometimes called Turpentine tree in the West Indies.

THE MAHOGANY FAMILY

MELIACEÆ Ventenat



MELIACEÆ are almost wholly tropical in distribution. They are mostly composed of trees and shrubs classified into about 50 genera with some 700 species. The leaves are alternate, pinnate, or pinnately compound, without stipules, and not punctate with pellucid dots. The flowers are regular, perfect, polygamous or dioecious, and borne in panicles; the calyx is composed of from 3 to 6 sepals, the corolla of the same number of separate or slightly united petals, and there are 8 or 10 stamens in the staminate and perfect flowers, their filaments united into a tube; in the pistillate flowers the ovary is free from the calyx (superior), 3-celled to 5-celled, with from 2 to many ovules in each cavity. The fruit is a drupe, capsule or berry in the different genera.

Next to Mahogany the most important economic member of this family is the so-called Spanish cedar, also known as West Indian cedar and Cigar box wood; it is the West Indian and Central American tree *Cedrela odorata* Linnæus. The bark of this tree is also used medicinally in its native countries. The barks of many other members of the family are used medicinally principally as cathartics and anthelmintics, but Azedarach, the bark of the China tree, is the only one usually found in the drug trade of Europe and America.

Two genera are represented in our flora:

Ovules 2 in each cavity of the ovary; fruit a drupe; seeds wingless.

1. *Melia*.

Ovules many in each cavity of the ovary; fruit a large woody capsule; seeds winged.

2. *Swietenia*.

I. CHINA TREE

GENUS **MELIA** LINNÆUS

Species ***Melia Azedarach*** Linnæus



MELIA, of which this tree is the generic type (a Greek name of the Ash), includes about 25 kinds of Asiatic trees, having compound leaves and perfect, white or purple flowers in large axillary panicles. The 5 or 6 sepals are imbricated; the disk of the flower is ring-like; the petals are separate, twisted and narrow; the tube of stamens is nearly cylindric, expanded and 10-lobed or 12-lobed at the top, bearing 10 or 12 anthers; each lobe of this stamen-tube is 2-cleft or 3-cleft; the ovary is 3-celled to 6-celled and the stigma 3-lobed to 6-lobed. The fruits are numerous small drupes.

The China tree, or Pride of India, native of India or China, has become thor-

oughly naturalized in the southern States from South Carolina to Texas, and it



FIG. 547. — China Tree.

withstands the winter as far north as Chesapeake bay and Little Rock, Arkansas. It attains a height of 15 to 20 meters, with a trunk sometimes 2 meters thick, and flowers in the spring in the southern States.

The bark is furrowed, the twigs smooth. The deciduous leaves are stalked and twice compound, the numerous leaflets ovate to elliptic, thin, pointed, cut-toothed or lobed, 3 to 7 cm. long, and bright green; the stalked panicles of flowers are 3 dm. long or less, the flower-stalks 4 to 10 mm. long; the sepals are elliptic to oblong-lanceolate, pointed, about 2 mm. long; the purplish petals are narrowly oblong, blunt, about 1 cm.

long. The drupes are yellow, nearly globular to oblong, 1.5 to 2 cm. in diameter, smooth, enclosing a hard brown pit.

The pits are bored and strung like beads into necklaces, whence the name Bead tree, sometimes applied to this species. The tree grows rapidly, and is much planted for shade and ornament in the southern States and in the West Indies. It has a broad round top and rather dense deciduous foliage.

II. MAHOGANY

GENUS **SWIETENIA** JACQUIN

Species **Swietenia Mahagoni** Jacquin



THIS important tropical tree enters our area in peninsular Florida and the Keys, where it was formerly more abundant than now, as the large trees have been cut down for their valuable timber. It occurs in the Bahamas, and the other West Indies, but most abundantly on the continent from Mexico to Peru; its maximum height is 25 meters, with a trunk diameter of 4 m. It is sometimes called Madeira and Madeira redwood.

The trunk is straight and sometimes very large, with immense buttresses at its base. The branches are large and spreading, forming a dense round head. The bark is about 16 mm. thick, its surface breaking into thick, short, dark reddish brown scales. The twigs are angular, smooth and reddish, soon becoming round and gray. The alternate leaves are persistent, evenly pinnate, 1 to 2 dm. long, consisting of 4 to 8 leaflets and a slender, smooth leaf-stalk which is enlarged at

the base. The leaflets are leathery, ovate or ovate-lanceolate, 3 to 8 cm. long, taper-pointed, very unequal-sided, entire on the margin; they are shining dark green and smooth above, paler and smooth or with some brownish hairs beneath. The flowers, appearing in early summer in Florida, are perfect, in axillary open panicles 6 to 15 cm. long. The calyx is small, cup-shaped, its 5 teeth broadly rounded, about 1 mm. long; the disk is annular; the corolla is white, 8 to 9 mm. across, the petals spreading, oblong to obovate and blunt or notched; the stamens are united into a smooth tube with 10 teeth above, the 10 anthers attached on the back at the sinus and opening lengthwise; the ovary is ovoid, 5-celled; style erect; stigma disk-like and 5-rayed; ovules many in each cell. The fruit is a 5-celled capsule splitting from the base into 5 thick valves, the 5-winged axis



FIG. 548. — Mahogany.

persistent; it is ovoid, 6 to 12 cm. long, brown and rough; the flat seeds are 18 mm. long, the broad thin wing ovate, blunt, thick, wrinkled and brown.

The wood is very hard and strong, close-grained, red, darkening with age; its specific gravity is about 0.73. It is very durable and of the highest value in cabinet work and interior finishing and is cultivated in the East Indies for its valuable timber.

The genus is a small tropical one of probably not over 3 species, 2 American and 1 African. The name is in commemoration of Gerard von Swieten (1700-1772), a noted physician and botanist of Leyden and Vienna. Our tree is the type of the genus.

THE SPURGE FAMILY

EUPHORBIACEÆ J. St. Hilaire



HIS family includes about 210 genera containing some 4000 species of trees, shrubs and herbs with acrid, often milky juice, natives of all parts of the globe. They vary greatly, from the most humble herb of the cooler regions to large thick cactus-like plants, and the noble trees of the tropics. Some are of great economic importance, especially the South American *Hevea brasiliensis* J. Mueller, and other species of *Hevea*, the milky juice of which yields the valuable Para rubber. Another South American plant of great importance is the Cassava, *Manihot Manihot* (Linnæus) Lyons, now cultivated in all warm countries for the starch contained in the large roots. The seeds of many of the plants of this family yield fixed oils, most of which are more or less irritant and consequently purgative when taken internally; best known of these are Castor oil, expressed from the ripe seeds of *Ricinus communis* Linnæus, cultivated for this purpose in warm countries, also that most powerful oil of a similar nature, Croton oil, from *Croton Tiglium* Linnæus, native of the East Indies, and Purging nut oil from the seeds of *Jatropha Curcas* Linnæus of the West Indies. Cascarilla, an aromatic medicinal bark, is produced by the Bahamian shrub *Croton eluteria* (Linnæus) Swartz; the poisonous Gum euphorbia is also produced by members of this family. Among ornamental plants the brilliant foliage of various species of *Acalypha* and of *Codiaeum*, the latter under the name of Crotons, is well known. The Cactus-like *Euphorbias* of the Old World are favorite hedge plants in the tropics on account of their spiny armament and the acrid, irritating milky juice that exudes from their stems when broken. The thorny *Euphorbia splendens* Linnæus, known as Christ's thorn, is noted for its brilliant scarlet bracts as well as for its grotesque form. *Poinsettia pulcherrima* (Willdenow) Graham, is a well-known conservatory plant, with very large vivid scarlet bracts.

The *Euphorbiaceæ* have very various leaves; they may be alternate, opposite, verticillate, or in the Cactus-like species are often entirely wanting or reduced to scales; they often have glands at their base; stipules present or wanting. The flowers are monœcious or diœcious, regular. The calyx is of several sepals; the petals equal in number to the sepals, sometimes much reduced, or often entirely wanting, the flowers frequently subtended by an involucre of petal-like bracts; stamens few or many in one or more series, their filaments distinct or united; ovary usually 3-celled; ovules 1 or 2 in each cell, pendulous; styles as many as the cells of the ovary, simple, divided or many-cleft. The fruit is mostly a 3-lobed capsule frequently separating with great force on ripening into 3 2-valved carpels,

often leaving a permanent axis; seed anatropous; embryo straight in fleshy or oily endosperm; cotyledons broad.

The genera containing our arborescent species are:

Ovules and seeds 2 in each cell; fruit a fleshy drupe; flowers in small clusters. 1. *Drypetes*.

Ovule and seed solitary in each cell; flowers, at least the staminate, spicate.

Styles 2 or 3; ovary 2- or 3-celled; fruit capsular, 2- or 3-lobed.

Pistillate flowers and capsules stalked; American tree.

2. *Gymnanthes*.

Pistillate flowers and capsules not stalked; introduced trees.

3. *Sapium*.

Styles 6 to 8; ovary 6- to 8-celled; fruit pulpy.

4. *Hippomane*.

I. THE DRYPETES

GENUS **DRYPETES** VAHL



DRYPETES consists of about 10 species of evergreen trees or shrubs of tropical America, 2 of which occur in our area. They have a thick, milky juice, but are of no known economic value except for their wood.

They have persistent, alternate, leathery leaves; the stipules are small and fall off very early. The flowers are dioecious, without petals; the staminate flowers are in dense axillary clusters, their calyx consisting of 4 to 8 imbricated nearly separate sepals, deciduous or persistent in fruit; the stamens as many or twice as many as the divisions of the calyx, inserted under the edge of a disk, their filaments thread-like, distinct; anthers extrorse, erect, ovate, 2-celled and opening lengthwise; ovary sometimes rudimentary, usually none. The pistillate flowers are in sparse axillary clusters on short, sometimes stout pedicels with deciduous bracts at their base; calyx similar to that of the staminate flowers; the ovary is sessile on the disk, 1- or 2-celled; style very short or wanting; stigma 1 or sometimes 2, disk-like or 2-lobed; ovules 2 in each cell. The fruit is drupaceous with a fleshy pulp and a hard stone; the seed has a crustaceous coat, fleshy endosperm and erect embryo.

The name is Greek and refers to the drupaceous fruit; the type species is *Drypete glauca* Vahl, of Porto Rico and other West Indian islands. Our arborescent species are:

Sepals 4; ovary 2-celled; fruit subglobose, 8 to 10 mm. long.

1. *D. lateriflora*.

Sepals 5; ovary 1-celled; fruit slightly elongated, 2 to 2.5 cm. long.

2. *D. diversifolia*.

1. GUIANA PLUM -- *Drypetes lateriflora* (Swartz) Urban

Schaefferia lateriflora Swartz. *Drypetes crocea* Poiteau

A small evergreen tree or shrub inhabiting woods in southern peninsular Florida, the Keys and the West Indies, attaining a height of 10 meters, with a trunk diameter of 2.5 dm. It is also called Whitewood.



FIG. 549. — Guiana Plum.

The trunk is short, its branches ascending or erect, the tree becoming round topped. The bark is about 1.5 mm. thick, close, light reddish brown, smooth or somewhat scaly. The twigs are round, slender, light green becoming gray. The leaves are somewhat leathery, oblong or elliptic, 5 to 12 cm. long, sharp or short taper-pointed at both ends, entire on the margin, slightly hairy when young, becoming smooth, shining and dark green above, paler and prominently reticulated beneath; the leaf-stalk is slender, grooved, 5 to 10 mm. long. The flowers appear late in the autumn or during the winter in the axils of the leaves or at leafless nodes. The calyx is greenish, hairy,

deeply 4-lobed, the blunt lobes oblong or ovate, 1.5 to 2 mm. long. The staminate flowers have 4 stamens, their filaments slender; anthers notched and hairy; there is no ovary. The pistillate flowers have an ovoid, hairy, 2-celled ovary. The drupes are solitary or 2 or 3 together on short stout stalks, subglobose, 8 mm. in diameter, dark brown and hairy; the flesh is thin and dry; seed obovoid, swollen on one side, 3 mm. long.

The wood is hard, brittle, close-grained, dark red-brown with thick yellow sapwood; its specific gravity is about 0.92. It has no special application.

LARGER GUIANA PLUM — *Drypetes diversifolia* Urban

Drypetes keyensis Urban. *Drypetes glauca* Nuttall, not Vahl

This is a taller evergreen tree, or often a shrub, of sandy or rocky soils of the Florida Keys and the Bahamas; it sometimes attains a height of 15 meters, with a trunk diameter of 5 dm.

The branches are stout, usually erect or ascending, or the lower spreading, forming a round-topped tree. The white bark is about 12 mm. thick. The twigs are stout, green and slightly hairy, becoming gray or white, with large leaf scars. The leaves are thick and leathery, oblong, elliptic or oval, 5 to 10 cm. long, blunt or pointed, thickened on the mar-



FIG. 550. — Larger Guiana Plum.

gin, dark green and shining, with the midrib prominent above, pale, glaucous and reticulated beneath; leaf-stalk short, grooved above, yellowish. The flowers appear in early spring in the axils of the leaves of the previous season. The staminate are in many-flowered clusters, on pedicels shorter than the leaf-stalk: calyx yellowish, lobed, oblong or oval, blunt and smooth; stamens 8, filaments unequal; anthers nearly as broad as long, hairy. The pistillate flowers are usually solitary, the ovary hairy, 1-celled; stigma broad, almost sessile. The fruit is an oblong or ovoid drupe 2 to 2.5 cm. long, bright white, very conspicuous among the dark green leaves; flesh thick and pulpy, stone obovoid, much narrowed at the base; the seed is oblong, rounded at each end, 10 mm. long, light brown and marked by conspicuous radiating veins.

The wood is hard, weak, brittle, dense, and brown; its specific gravity is about 0.93. Leaves of seedlings and of shoots from cut stumps are coarsely toothed with bristle-tipped teeth. It is called Whitewood in the Bahamas.

II. CRABWOOD

GENUS **GYMNANTHES** SWARTZ

Species **Gymnanthes lucida** Swartz



ALSO called Poisonwood, this is a small milky-sapped evergreen tree or shrub of peninsular Florida and the Keys, also in the Bahamas and other West Indies generally; its maximum height is 10 meters, with a trunk diameter of 2 dm.

The ridged trunk is slender, sometimes much enlarged at the base. The branches are slender, erect or ascending. The bark is about 1.5 mm. thick, smooth or somewhat scaly and dark brown. The twigs are slender, round, light green, becoming gray. The leaves are alternate, thick, obovate to oblong-spatulate or nearly oblong, 5 to 10 cm. long, blunt-pointed, tapering at the base, entire or wavy on the margin, becoming dark green, smooth and shining above, pale, dull and prominently veined beneath; the petiole is slightly grooved, 5 to 20 mm. long, the stipules small, falling early. The small green flowers are monœcious, the staminate in slender axillary



FIG. 551. — Crabwood.

scaly spikes 2 to 5 cm. long; calyx minute; stamens 2 or 3, their thread-like filaments distinct; anthers erect, ovoid, 2-celled, opening lengthwise; the pistillate flowers are at the bases of the spikes, solitary, or in clusters of 2 or 3, on slender peduncles 12 to 15 mm. long, and consist of a rudimentary 3-lobed perianth and a 3-celled angular ovary, with 3 recurved styles which are stigmatic on their inner faces; ovules solitary in each cell. The 3-lobed capsule is borne on a slender stalk 2.5 to 3.5 cm. long; it is depressed-globose, about 1 cm. in diameter, dark brown to black, the lobes rounded; it splits into 3 parts with a hard, shining inner surface leaving a white central axis; the seeds are globose to ovoid, 3 to 5 mm. thick, bright brown, with a flat, circular appendage.

The wood is hard, close-grained, and dark brown; its specific gravity is about 1.09. It takes a fine polish and is sometimes made into canes.

This genus comprises about 10 species, all tropical American trees or shrubs of no especial economic value. The name is Greek, in reference to the very simple flowers, *Gymnanthes elliptica* Swartz, of Jamaica being the type.

III. THE TALLOW TREES

SAPIUM PATRICK BROWNE



SAPIUM consists of about 25 species of milky-juiced trees or shrubs of the tropical regions of both hemispheres. The West Indian *Sapium Aucuparium* Jacquin, is the type species.

They have alternate or opposite, mostly leathery leaves, their stipules falling off early. The flowers are diœcious or rarely monœcious, with but one series of the perianth present, in axillary, lateral or apparently terminal spikes or racemes. Flowers without a disk, in long, slender spikes, the staminate perianth 2- or rarely 3-parted, the lobes nearly equal; stamens 2 or 3, their filaments distinct; anthers opening lengthwise. The pistillate flowers are below the staminate, the perianth of 2 or 3 more or less united parts; ovary 2- or 3-celled; styles 2 or 3, slightly united at the base; ovules solitary in each cell. The fruit is a 2- or 3-lobed capsule, the 2 or 3 cells each containing a single seed; the seeds have a thick hard testa, coated with a wax-like substance.

The name is probably derived from the Celtic "sap," meaning fat, in reference to the waxy coating of the seed.

Two arborescent species have been introduced into our area:

Leaves rhombic; capsules 3-lobed; seed 8 to 9 mm. long; poplar-like tree.

1. *S. sebiferum*.

Leaves linear-oblong or narrowly oblong; capsules 2-lobed; seed 6 to 7 mm.

long; willow-like tree.

2. *S. glandulosum*.

1. CHINESE TALLOW TREE — *Sapium sebiferum* (Linnaeus) Roxburgh*Croton sebiferum* Linnaeus. *Stillingia sebifera* Michaux

This large poplar-like tree has been introduced into our area as a shade tree from China or Japan, and has become naturalized from North Carolina to Florida and Louisiana, where it reaches a maximum height of 15 meters.

The bark is about 10 mm. thick, rather smooth and reddish brown. The twigs are slender, round, smooth and marked by numerous leaf scars, yellowish brown or gray. The leaves are alternate, thin, or membranous, rhombic, 4 to 8 cm. long, taper-pointed, broadly wedge-shaped at the base, wavy on the margin, dark green and smooth above, paler beneath, prominently veined on either surface; the leaf-stalk is slender, with a gland near the top, and as long as or longer than the blade. The flowers appear in the spring in terminal, slender spikes 5 to 10 cm. long. The fruit is a 3-lobed capsule, 1.5 cm. in diameter, depressed-globose, abruptly pointed, dark brown, the thick walls separating readily into cleft segments exposing the 3 large seeds which are 8 to 9 mm. long, coated with a white, waxy substance under which is a dark brown, thick testa. They hang on by light threads for some time after the opening of the capsule, when their waxy whiteness is in strong contrast to the reddish autumnal foliage.



FIG. 552. — Chinese Tallow Tree.

The wood is hard, close-grained, nearly white; its specific gravity is about 0.51; it is used in Asia for furniture, and it is said that the Chinese make their wooden type or printing blocks from this wood. A brittle wax, used for candle making in Asiatic countries is obtained from the seed coat.

2. SOUTH AMERICAN MILK TREE — *Sapium glandulosum* (Linnaeus)

Morong

Hippomane glandulosa Linnaeus. *Hippomane biglandulosa* Linnaeus. *Sapium biglandulosum* J. Mueller

This willow-like, South American tree or shrub has become naturalized in Florida, especially about Pensacola; its maximum height is about 13 meters.

The bark is about 8 mm. thick, fissured into small scales of an ashy gray color.

The twigs are rather stout, smooth, yellowish or grayish brown and bear small



FIG. 553. — South American Milk Tree.

leaf scars. The leaves are alternate, thick, leathery, linear-oblong or narrowly oblong, 8 to 16 cm. long, pointed at the apex, narrowly wedge-shaped at the base, sharply but finely toothed on the margin, bright green and smooth above, paler and smooth beneath, the whitish midrib prominent on both sides; the leaf-stalk is rather stout, channelled, about 3 cm. long, with two yellowish glands at the base of the leaf-blade. The flowers are quite small, yellow, usually monœcious, in terminal, interrupted spikes 5 to 9 cm. long. The fruit is a 2-lobed grayish brown capsule about 1 cm. in diameter; the seeds are 6 to 7 mm. long, compressed, ellipsoid, coated with a

reddish waxy substance, their testa dark brown and crustaceous.

The milky sap is very abundant and it is said to exude profusely when the leaves are abraded by the wind, so as to spread all over the ground underneath the tree.

IV. MANCHINEEL

GENUS **HIPPOMANE** LINNÆUS

Species **Hippomane Mancinella** Linnæus



THIS evergreen tree of beaches and marshes of peninsular Florida, the Keys and from the Bahamas to tropical America, is probably the most poisonous member of our arborescent flora. In Florida it never reaches its maximum height of 18 meters and a trunk diameter of 9 dm., but scarcely exceeds one fourth these dimensions.

The branches are spreading, or somewhat drooping, perfect trees being round-topped. The bark is 12 to 25 mm. thick, closely scaly, brown or gray. The twigs are stout and pithy and marked by prominent leaf scars. The leaves are alternate, thick and leathery, ovate or oval, 4 to 10 cm. long, sharp or short taper-pointed, rounded or somewhat heart-shaped at the base, wavy or minutely toothed on the margin, dark yellowish green, smooth and shining with a yellowish midrib above, paler and dull with less prominent yellowish venation beneath; leaf-stalk slender, yellowish, about the length of the blade and with 2 reddish glands at the top; stipules early deciduous. The flowers are monœcious, yellowish green, opening from February to April in spikes 4 to 8 cm. long with a stout rachis. The clus-

tered staminate flowers occupy the upper portion of the spike and are subtended by broad bracts; the perianth is small, membranous, 2- or 3-lobed; stamens 2 or 3, their filaments more or less united into a short column below, separate and spreading above; anthers exerted, yellow, ovoid, extrorse, opening lengthwise. The pistillate flowers are very small, few or solitary, in the axils of the bracts below the staminate flowers and consist of an ovoid, 3-parted perianth surrounding the glandular, 6- to 8-celled ovary, which is contracted above into a short, cylindric style, with 6 or 8 stigmatic lobes; ovules solitary in each cavity. The fruit is drupaceous, globose, 2.5 to 3.5 cm. in diameter, slightly 6- to 8-lobed, yellowish green or light yellow and shaded with red; flesh thin, pulpy and milky juiced;



FIG. 554. — Manchineel.

pit depressed, bony, 6- to 8-celled, with many thorn-like projections on its thick walls; seeds ovoid, flattened, dark brown.

The wood of the Manchineel is soft, close-grained, dark brown; its specific gravity is about 0.53. It is said to be harder and heavier in the tropics, and to be used there for cabinet work. The acrid milky juice is very poisonous and was used by the Caribs to poison their arrows. The juice, and the smoke from the burning wood is very injurious to the eyes.

The genus is monotypic; its name is Greek, and was applied to this tree by Linnaeus, but used by ancient authors for some wholly different plant, reputed to excite horses.

THE SUMAC FAMILY

ANACARDIACEÆ Lindley



HIS family consists of about 50 genera comprising some 500 species of trees or shrubs and a few woody climbers, natives of temperate and tropical regions, but most abundant in the latter. They are noted for their acrid, resinous or milky juices which render them of varied economic value, in medicine, in the art of tanning, and the manufacture of varnishes, mastic, Japanese lacquer and other resins being products of members of this family. Edible tropical fruits in great variety are also produced by these plants, among the best known being the Mango and Spanish prune; Cashew nuts are a dry nut-like oily fruit remarkable for being surmounted on a large pear-shaped fleshy peduncle which when fully ripe is juicy and also edible; the fruit is roasted and eaten like peanuts. The Pepper tree of western South America, so much planted in California for ornament and shade, is *Schinus molle* Linnæus, its numerous bright red aromatic fruits being a substitute for pepper. This plant seems destined to become naturalized on the Pacific coast.

The *Anacardiaceæ* have alternate, simple or compound leaves without punctate dots and without stipules. The inflorescence is spicate, racemose or paniculate, with regular, rarely perfect, mostly polygamous flowers, their calyx of 3 to 7 slightly united sepals; petals as many as and alternate with the sepals, imbricated or rarely valvate; stamens as many or twice as many as there are petals, rarely otherwise, inserted at the base of the disk, their filaments free; anthers introrse, usually versatile; ovary in the staminate flowers 1-celled, in the pistillate 1-celled or sometimes 4- to 5-celled, usually free; styles united or distinct, terminal or lateral; stigmas entire; ovules solitary. Seeds without endosperm; cotyledons fleshy. Our genera are:

Leaves always compound.

Drupe broader than long.

Drupe densely hairy; stone smooth.

Drupe smooth; stone ribbed.

Drupe somewhat elongated, not flattened.

Leaves usually simple (occasionally 3-foliolate in No. 4).

Drupe flattened, hairy; stone roughened.

Drupe not flattened, smooth.

Drupe 4 mm. long; stone smooth; native southern tree or shrub.

Drupe 10 to 12.5 cm. long; stone covered with long, coarse fibers; introduced tropical fruit tree.

1. *Rhus*.

2. *Toxicodendron*.

3. *Mctopium*.

4. *Neostyphonia*.

5. *Cotinus*.

6. *Mangifera*.

I. THE SUMACS

GENUS **RHUS** LINNÆUS

ABOUT 20 Sumacs are now known, natives of North America, Europe and Asia. The type species is *Rhus coriaria* Linnæus, of southern Europe. Most of them are shrubs, but a few become small trees under favorable conditions. They have alternate compound leaves which turn red to crimson in autumn, either unequally pinnate with several or numerous leaflets, or in some low shrubs of the genus the leaves are three-foliolate, and in one southwestern form there is but one leaflet. The flowers are small, green or rarely white, borne in panicles at the ends of branches, and open long after the leaves appear, or in some shrubs in spike-like clustered racemes and open before the leaves unfold; they are diœcious or mainly so; there are usually 5 sepals, and as many petals and stamens; the stamens of the pistillate flowers are very short and usually abortive, those of staminate flowers often as long as the petals; the ovary in the pistillate flowers is ovoid, 1-celled, and contains one pendulous ovule; there are 3 styles, each with a knob-like stigma. The fruits are small drupes covered with acid hairs, the stone smooth, not ribbed, bony.

The North American Sumacs which form trees may be distinguished as follows:

Rachis of the leaf wing-margined.

Leaflets ovate to oblong-lanceolate, acute.

1. *R. copallina*.

Leaflets narrowly lanceolate, acuminate.

Leaflets falcate; Texan tree.

2. *R. lanceolata*.

Leaflets not falcate; southern tree.

3. *R. leucantha*.

Rachis of the leaf not wing-margined.

Twigs densely velvety.

4. *R. hirta*.

Twigs smooth, or nearly so, usually glaucous.

5. *R. glabra*.

1. DWARF SUMAC — **Rhus copallina** Linnæus

Schmaltzia copallina Small

While almost always a mere shrub seldom over 4 meters high, this species occasionally becomes a tree 6 meters tall, with a trunk 1.5 dm. thick; it grows in dry soil, preferring hillsides, and ranges from Maine to Florida, Ontario, Minnesota, Nebraska and Texas. Its sap is watery, not milky.

The reddish brown bark is thick and scaly. The young twigs are finely velvety, stout. The very small buds are round and scarcely 2 mm. long. The leaves are 3 dm. long or less, their stalks hairy and nearly round, the leaf-axis between the 9 to 21 leaflets, wing-margined; the leaflets are rather thick, stalkless or very short-stalked, ovate to oblong-lanceolate, entire-margined or few-toothed toward the apex, pointed, dark green and smooth on the upper side, paler and usually finely hairy on the under, 2.5 to 7.5 cm. long. The flowers are in dense



FIG. 555. — Dwarf Sumac.

The Texan sumac has usually been regarded as a variety of the preceding species, and was originally described as of this relationship, but it is confined to Texas, in so far as its geographic distribution is known, and seems to have marked differences from its widely distributed relative. It grows in dry soil, especially on limestone, attaining a maximum height of about 10 meters, with a trunk 2 dm. in diameter, usually, however, much smaller, and often a mere shrub.

The bark is light brown and nearly smooth. The young twigs are quite densely velvety. The leaf-stalk is velvety and the leaf-axis winged between the 9 to 19 stalkless or very short-stalked leaflets, which are narrowly lanceolate, long-pointed, more or less scythe-shaped, 7 cm. long or less, and usually entire-margined; they are dark green on the upper surface and pale green beneath. The tree flowers in July or August and its flowers closely resemble those of *R. copallina*. The fruits are covered with short hairs and are described as dull red or green; they are borne on very short stalks.

The light brown wood has a specific gravity of about 0.52.

panicles 7 to 16 cm. long at the ends of branches, the staminate on one plant, the pistillate on another, and open from June to August; they are green and about 3 mm. broad, the calyx much shorter than the blunt reflexed petals; the hairy flower-stalks are 2 to 4 mm. long. The fruits are somewhat flattened, about 4 mm. thick, densely covered with crimson acid hairs; the smooth stone is orange-brown.

The leaves are a source of tannin. The wood is soft, light brown, with a specific gravity of about 0.53.

2. TEXAN SUMAC

Rhus lanceolata (Asa Gray) Britton

Rhus copallina lanceolata Asa Gray
Schmaltzia lanceolata Small



FIG. 556. — Texan Sumac.

3. SOUTHERN SUMAC — *Rhus leucantha* Jacquin

This little-known tree or shrub was well described and illustrated by Jacquin in 1798, but this author did not know where it grew naturally, his description and figure having been drawn from plants grown under glass in the garden at Schoenbrunn, Vienna. It is now known to inhabit extreme southern Florida and Cat island near the mouth of the Mississippi River, and probably occurs at intermediate points. There is a similar tree or shrub in the province of Pinar del Rio, Cuba, but the specimen of this plant that we have seen does not enable us to decide whether it represents the same species or not. In the region south of Miami, Florida, it is a tree reaching a height of about 8 meters, with a trunk about 1 dm. thick.



FIG. 557. — Southern Sumac.

The bark of the Florida tree is thin, bright red, smooth and shining. The young shoots are finely hairy. The axis of the leaves is winged between the leaflets as in the Dwarf sumac and the Texan sumac; there are 17 to 31 leaflets, which are short-stalked or stalkless, lanceolate, unequal-sided, but not scythe-shaped, 5 to 9 cm. long, long-pointed, narrowed at the base, dark green, dull and smooth on the upper surface when mature, finely hairy on the under side. The flowers are described as white. The fruit is similar to that of *Rhus copallina* and similarly covered with red hairs.

4. STAGHORN SUMAC — *Rhus hirta* (Linnæus) Sudworth

Datisca hirta Linnæus. *Rhus typhina* Linnæus. *Schmaltzia hirta* Small

Usually a large shrub, the Staghorn sumac or Hairy sumac sometimes becomes a tree up to 13 meters high, with a trunk 3 to 4 dm. in thickness. It prefers dry soil, commonly growing on hillsides, though sometimes near the borders of swamps, and occurs from Nova Scotia to Georgia, westward to Ontario, South Dakota, Missouri, and Mississippi; it is uncommon near the coast south of New York. The sticky, milky sap turns dark in contact with the air.

The bark is dark brown, smooth, or, when old, somewhat scaly. The young twigs are very stout, densely pink-velvety, becoming green and finally smooth and brown after about four years' growth. The buds are yellowish hairy, round,

about 3 mm. long. The leaves are from 2 to 6 dm. long, with 11 to 31 leaflets and a round hairy stalk and axis; the leaflets are very short-stalked or stalkless, lanceolate to oblong-lanceolate, 7 to 12 cm. long, long-pointed, sharply toothed, firm, dark green and nearly smooth on the upper surface when fully grown, pale and somewhat hairy, at least on the veins, on the under side. The tree flowers in June or early July; the dense panicles of flowers are at the ends of branches, 3 dm. long or less, those of staminate flowers on one tree, the pistillate on another; the individual flowers are green and about 3 mm. wide when expanded; the calyx is hairy and its lobes pointed; the petals of the staminate flowers are reflexed, those of the pistillate flowers erect or a little spreading. The bunches of fruit are about 2 dm. long, the little drupes nearly globular,



FIG. 558. — Staghorn Sumac.

lar, densely covered with crimson hairs, the stone smooth and bony.

The wood is soft, orange-green, coarse-grained, with a specific gravity of about 0.44. The bark contains much tannin.

5. SMOOTH SUMAC — *Rhus glabra* Linnæus

Schmalzia glabra Small

While usually a shrub, growing in colonies, this species occasionally forms a tree 6 or 7 meters high, with a trunk 1 dm. thick. It is very widely distributed in North America, ranging from Nova Scotia to Ontario, Michigan and Minnesota, south to Florida, Mississippi, and Louisiana, preferring hillsides. It is also known as Upland sumac and Scarlet sumac.

The thin bark is gray and nearly smooth. The stout young shoots are smooth and often covered with a bluish bloom. The buds are globose, 3 to 4 mm. long, and whitish-wooly. The leaves are smooth, with a round wingless axis, and have 11 to 31 lanceolate or oblong-lanceolate leaflets, which are 10 cm. long or less, stalkless or very short-



FIG. 559. — Smooth Sumac.



FIG. 560. — Smooth Sumac, Carnot, Pa.

stalked, long-pointed, sharply toothed, dark green on the upper side and whitish on the under. The small green flowers are in dense panicles, and open from June to August, according to latitude; the flower-stalks are sometimes a little hairy. The fruit ripens late, and is covered with short reddish acid hairs. Some fifteen supposed species to be included in this, have recently been described.

II. POISON SUMACS

GENUS **TOXICODENDRON** [TOURNEFORT] MILLER



POISON sumacs include about 16 species of shrubs, vines, and trees, natives of North America and Asia. They all have a poisonous sap, which excites painful inflammation to most people who come in contact with it, a mere touch of a leaf or twig sufficing in many instances; some people are apparently immune, however. The generic name is in allusion to

these poisonous qualities. The leaves of these plants are unequally pinnate or 3-foliolate, the leaflets either entire-margined, or variously toothed or lobed. The small green flowers are in axillary or lateral clusters, usually panicles; they are either diœcious or polygamous; the 4 to 6 sepals are persistent at the base of the fruit; there are 4 to 6 petals and usually as many stamens, those of the pistillate flowers small and usually abortive; the ovary in the pistillate flowers is one-celled, enclosing 1 pendulous ovule. The fruit is a drupe, with a thin smooth outer coat, which early separates and falls away from the inner, which is waxy and encloses a ribbed stone. The type species is *Toxicodendron vulgare* Miller, one of the Poison Vines of eastern North America.

Only one of the several North American species forms a tree.

POISON SUMAC—*Toxicodendron Vernix* (Linnæus) Shafer

Rhus Vernix Linnæus. *Rhus venenata* de Candolle

This small tree inhabits swamps and occurs from southern Ontario and Vermont to eastern Massachusetts and Florida, westward to Minnesota, Arkansas, and Louisiana. It is also known as Poison elder, Poison ash, Poison oak, Swamp

dogwood, and Poison dogwood, and is dangerously poisonous to the touch. It sometimes attains a height of 8 meters, with a trunk 1.5 dm. in diameter, but is usually smaller, and often a mere shrub. Some people are said to be affected by coming close to the plant without actually touching it.

The smooth bark is thin and light gray. The young twigs are smooth, brown or orange-brown. The buds are pointed, purplish, the terminal ones 2 cm. long or less, their scales finely hairy. The leaves are smooth, except when quite young, when they are quite hairy; when fully grown they are 1.5 to 4 dm. long, their stalks round and slender, the 6 to 12 lateral leaflets stalkless or very short-stalked, ovate or rhombic, thin, 2.5 to 15 cm. long, pointed, green on



FIG. 561. — Poison Sumac.

both sides and entire-margined; the terminal leaflet is long-stalked. The axillary panicles of flowers are 7 to 20 cm. long, the staminate ones on one tree, the pistillate on another; the numerous insignificant flowers are about 2 mm. broad, opening in June or July; the usually 5 pointed lobes of the calyx are much shorter than the narrow petals, whose tips are slightly reflexed. The large panicles of

fruit remain on the tree through the winter; the fruits are grayish white or yellowish, nearly globular or somewhat longer than thick, about 4 mm. in diameter, shining, a little flattened; the stone is longitudinally grooved.

The wood is yellowish, light and soft, and of no economic value; its specific gravity is about 0.44. The leaflets become orange to scarlet in the autumn, and thus very conspicuous, causing much poisoning to people who gather autumn leaves indiscriminately. The sap furnishes a varnish similar to that commercially obtained from the Japanese Lacquer-tree, *Toxicodendron verniciferum* (de Candolle) Shafer, (*Rhus vernicifera* de Candolle), which closely resembles our plant.

Other local common names for this tree are Swamp sumac, Thunderwood, and Poisonwood.

III. POISONWOOD

GENUS **METOPIMUM** PATRICK BROWNE

Species **Metopium Metopium** (Linnæus) Small

Rhus Metopium Linnæus



POISONWOOD, Bum-wood, or Hog-gum, is a monotype, no other species of *Metopium* being known. It inhabits southern Florida, the Bahamas, Porto Rico, Cuba, and Jamaica, occurring also in Central America. Its sap is dangerously poisonous to the touch, and some people are said to be affected by mere proximity to the plant; a purgative gum-resin exudes from the bark. The tree attains a height of 13 or 14 meters, with a trunk sometimes 6 dm. thick; the branches spread widely.

The bark is thin, splitting when old into large scales; it is red-brown outside and orange within. The young twigs are stout, red-brown and smooth, the buds pointed, their scales hairy-fringed. The leaves, borne near the ends of twigs, are alternate, smooth, firm in texture, unequally pinnate, 3 dm. long or less, with from 3 to 7 stalked leaflets, which are ovate to nearly orbicular or obovate, 2.5 to 10 cm. long, pointed, notched or blunt at the apex, the base narrowed, truncate or heart-shaped, the upper surface bright green and shining, the under side dull green, the margin entire, sometimes slightly revolute; the stalks of the leaflets vary from 1 to 3 cm. in length. The flowers are small but very numerous, in loose, upright axillary panicles as long as the leaves or longer; they open from February



FIG. 562. — Poisonwood.



FIG. 563. — Poisonwood, Inagua, Bahamas.

to May, the staminate and pistillate on different trees; the stout flower-stalks are from 2 to 4 mm. long; the calyx has 5 round blunt sepals, much shorter than the 5 ovate blunt petals, which are yellowish green; in the staminate flowers the 5 stamens are somewhat shorter than the petals; the pistillate flowers have a globular 1-celled ovary with a short style and 3 short stigmas, the usually 5 stamens very short and abortive. The fruits are oblong, orange-yellow shining drupes 1 to 1.5 cm. long, the stone thin-walled; the bunches of fruit are spreading or pendulous.

The wood is weak, dark brown, heavy, its specific gravity being about 0.80. The tree is also locally known as Doctor-gum and Coral sumac.

IV. THE CALIFORNIA MAHOGANY

GENUS **NEOSTYPHONIA** SHAFER

Species ***Neostyphonia integrifolia*** (Nuttall) Shafer

Styphonia integrifolia Nuttall



THE name *Styphonia* (in reference to its astringent bark), given to this tree by Nuttall in 1838, had already been applied to a genus of the Mint family by Medicus in 1791, Nuttall's name is invalid. The genus includes about 5 species of trees and shrubs, natives of California, Lower California, and Mexico. Their leaves are simple, or rarely 3-folio-

late, coriaceous, and evergreen. The flowers are mainly diœcious, and borne in dense bracted racemes arranged in panicles at the ends of branches, opening very early in the spring. The fruit is densely hairy, enclosing a bony, smooth stone.

The California mahogany, also called California sumac, the type of the genus, occurs in southern California, northern Lower California, and on the adjacent islands of the Pacific Ocean, growing in sandy or rocky soil along and near the coasts. It occasionally becomes 10 meters in height, with a trunk about a meter in diameter, but is usually much smaller, and commonly a mere shrub, forming thickets; its branches are long and spreading.

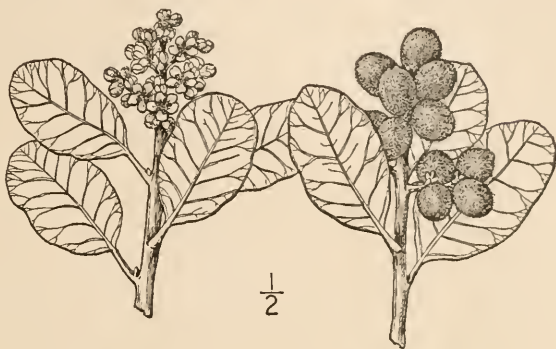


FIG. 564. — California Mahogany.

The bark is thin, reddish brown and scaly. The young twigs are finely velvety, red-brown, becoming smooth or nearly so after about three years' growth. The buds are round, small and hairy. The leaves are thick and leathery, entire-margined or sometimes spiny-toothed, rarely divided into 3 leaflets, with the 2 lateral leaflets smaller than the terminal one; they are ovate to oval, finely hairy when very young but smooth on both sides, except on the veins of the lower surface when mature, 8 cm. long or less, thick-stalked, shining green on the upper side, pale green beneath. The dense clustered racemes are 1 to 3 cm. long; the flower-stalks are thick and very short, bearing 2 to 4 ovate pointed hairy-fringed bracts; the small flowers are pink, the sepals nearly orbicular and the petals reflexed. The ovoid fruit is 1 to 1.5 cm. long, flattened, densely covered with red hairs; it is resinous and viscid-juicy.

The wood is hard, bright red, with a specific gravity of about 0.78, and furnishes a valuable fuel.

V. SMOKE TREE

GENUS **COTINUS** ADANSON

Species **Cotinus americanus** Nuttall

Rhus cotinoides Nuttall. *Cotinus cotinoides* Britton



NLY 2 species of *Cotinus* are known, one inhabiting southern Europe and warm-temperate Asia, commonly planted for ornament, the other, long considered identical with it, being found wild in a few places in the southern and south-central United States. The two species are very much alike; they both having simple leaves and large panicles

with small flowers, the panicles mostly composed, however, of capillary hairy sterile flower-stalks, nearly of a smoke color, whence the popular name of the trees.

The American smoke tree, or Chittam-wood, occurs sparingly in rocky situations, preferring limestone, in Alabama, eastern Tennessee, Missouri, Kansas, the Indian Territory, and western Texas. It attains a maximum height of about 12 meters, with a trunk diameter up to 4 dm. Its branches spread widely.



FIG. 565. — Smoke Tree.

The thin bark is light gray, channelled and scaly. The sap is resinous and unpleasantly odorous. The young twigs are smooth, purplish, becoming green to brown. The pointed buds are 3 or 4 mm. long. The leaves are thin, oval to obovate, 5 to 15 cm. long, their stalks 3 cm. long or less; they are blunt or sometimes notched at the apex, narrowed or somewhat wedge-shaped at the base, silky-hairy on the under side when young, but merely puberulent on the veins of the under side when mature, dark green on the upper side, paler green beneath, entire-margined or a little wavy. The flowers

are in large panicles at the ends of branches and open in April or May; most of the panicle is made up of the sterile hairy flower-stalks, the flowers being few and their stalks smooth; the staminate and pistillate flowers are produced by different trees; there are bracts 1 to 1.5 cm. long among the flowers, but these fall away before the fruit is mature; the calyx has 5 lobes and there are 5 oblong petals; the flower-stalks are slender, usually 2 to 4 of them together at several places in the panicle. The fruits are obliquely oblong, smooth, about 4 mm. long, their slender stalks 5 to 8 cm. long.

The wood is soft, orange-yellow, coarse-grained, durable, with a specific gravity of about 0.64, and is locally used for fencing. The Old World smoke tree, *Cotinus* (Linnaeus) Sargent, the generic type, differs from our plant in its thicker, more hairy leaves, which are rounded or blunt at the base.

VI. MANGO

GENUS **MANGIFERA** LINNÆUSSpecies **Mangifera indica** Linnæus

THIS tropical Asiatic evergreen tree is now cultivated in all tropical countries for its fruit and has become naturalized in many places. In Florida it has become established in hammocks on the peninsula and on some of the Keys. It reaches a maximum height of about 21 meters, with a trunk diameter of 2.5 meters, often buttressed at the base.

The branches are numerous and outspreading, forming a dense round head. The bark is rather rough and gray. The twigs are slender, smooth, and of a purplish red tinge. The persistent leaves are alternate, thick and leathery, oblong-lanceolate to lanceolate, 15 to 25 cm. long, blunt, sharp or taper-pointed, tapering at the base, entire on the margin, dark green and shining, with impressed venation above, scarcely paler, smooth and prominently veined beneath, the leaf-stalk grooved, thickened at the base and about 2.5 cm. long. The flowers are produced in large terminal compound panicles, in great numbers; it is said that 2100 individual flowers have been counted in a single panicle; the flower stalks are densely covered with yellow hairs. The calyx is 5-parted; petals 5, rarely 4, inserted at the base of a 4- or 5-lobed disk; stamens 4 or 5, only 1 or 2 of which bear anthers; ovary 1-celled with a single ascending ovule; style simple and curved. The fruit, which is abundantly produced in pendulous clusters, is a usually kidney-shaped drupe 10 to 12.5 cm. long, the skin smooth, light green, yellow or reddish; the flesh is soft, juicy, acidulous and aromatic; the large stone is covered with a coat of coarse fibers, which extend into the flesh; the kernel is bean-shaped, nearly white; all portions of the tree have an aromatic turpentine-like odor.



FIG. 566. — Mango.

It is largely cultivated for its fruit and many improved varieties are grown that are free from the turpentine-like odor and taste characteristic of the common or unimproved form, and almost without fiber. It is used both ripe and green, fresh or cooked, and is made into pickles, jellies, and other preparations.

The wood is soft, rather coarse-grained and fibrous, strong and very elastic, brownish gray; its specific gravity is about 0.86; it is extensively used in the East Indies. The bark is used as a remedy for fevers. The genus contains about 30 species of trees or shrubs of tropical Asia. The name is Latin, meaning Mango bearing; Mango being the Hindu name of this tree, which is the type of the genus.

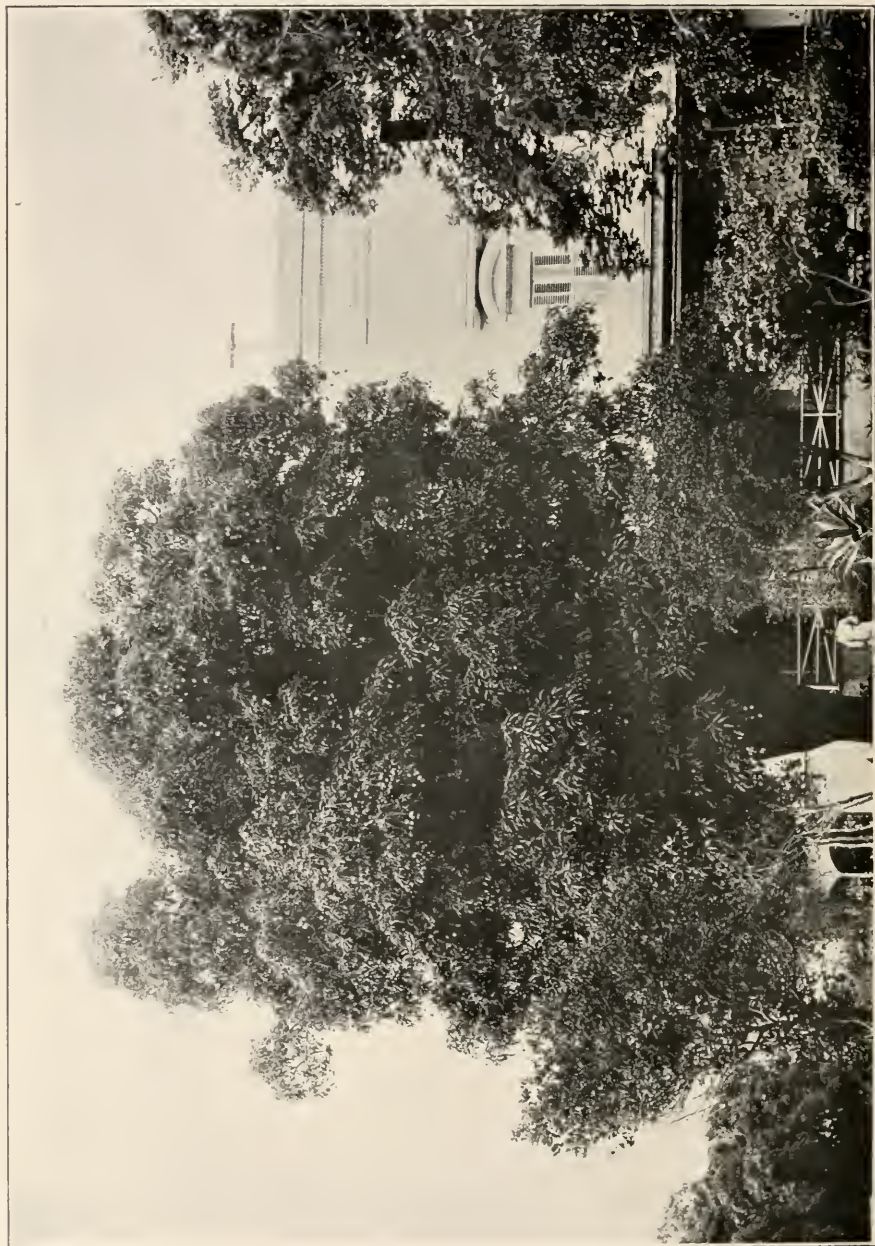


FIG. 567. — Mango Tree, Santurce, Porto Rico.

THE CYRILLA FAMILY

CYRILLACEÆ Lindley



YRILLACEÆ, a very small family, contains only 3 genera, of which but 6 species are known. They are small trees or shrubs usually growing in wet or swampy situations and occur, as far as is known, only in America. They are of no economic importance.

The *Cyrillaceæ* have alternate, simple, entire, rather persistent leaves that are mostly crowded near the ends of the twigs and are without stipules. The flowers are perfect and regular, in bracted racemes. Their calyx consists of usually 5, sometimes 4 to 8, persistent sepals; corolla of the same number of petals, distinct or slightly united, sessile or with short claws; stamens 4 to 10, in one or two series, the shortest being opposite the petals; filaments distinct and flattened; anthers introrse, 2-celled and opening lengthwise; disk annular, cup-like or cylindrical; ovary 2-celled to 5-celled, and angular; ovules 1 to 4 in each cavity; style usually none or short; stigma 2-lobed to 5-lobed, usually small. The fruit is small, crustaceous or spongy, dehiscent or indehiscent, sometimes winged; the 1 to 5 seeds are oblong or spindle-shaped, their coating smooth or soft, mucous-like and merging into the fleshy endosperm; embryo cylindric. Our genera are:

Inflorescence lateral; sepals 5, equal; fruit wingless and dehiscent.

1. *Cyrilla*.

Inflorescence terminal; sepals 5 to 8; fruit winged and indehiscent.

2. *Cliftonia*.

LEATHER-WOOD

GENUS **CYRILLA** [GARDEN] LINNÆUS

Species ***Cyrilla racemiflora*** Linnæus



YRILLA includes three closely related species, natives of warm-temperate and tropical America. It is the type of a small family of trees and shrubs, and takes its name in honor of Domenico Cirillo, Italian naturalist (1734-1799). The Leather-wood, which is the generic type, grows in sandy soil, mostly in swamps and along streams, from Virginia to Florida, westward, near the Gulf of Mexico, to Texas. It attains a maximum height of about 10 meters, with a trunk 3 dm. in thickness, but is usually much smaller, and often a shrub. Its branches spread widely. The plant is also known as Iron-wood, Burnwood, Red titi and White titi.

The very thin bark is pale brown, breaking up into large scales. The young twigs are smooth and round, red-brown to gray, the buds pointed. The simple

alternate entire-margined leaves are leathery, narrowly to rather broadly oblanceolate to obovate or oblong, 2 to 10 cm. long, 1 to 3 cm. wide, rather strongly netted-



FIG. 568. — Leather-Wood.

veined, blunt or pointed, dark green and shining on the upper side, dull green and paler on the lower; their stalks are from 3 to 15 mm. long and they have no stipules. The small white or pinkish flowers are regular and perfect, borne in long narrow clustered racemes near the ends of twigs, soon coming to be at the bases of twigs of the season; the individual flower-stalks are subtended by narrow pointed bracts and bear two smaller bracts near the base of the flower; the flowers open in June or July and have 5 equal sepals about 1 mm. long, 5 much longer pointed petals, 5 stamens somewhat shorter than the petals and alternate with them, a 2-celled ovary with a short style and 2 short stigmas. The fruits are blunt 2-celled capsules about

2.5 mm. long, which split open when ripe to release the few pointed seeds.

The wood is heavy and hard, but weak, reddish brown, close-grained; its specific gravity about 0.68.

Cyrilla antillana Michaux, of the West Indies and northern South America, has thicker, blunter leaves; it may occur in southern Florida.

TITI

GENUS **CLIFTONIA** GÆRTNER

Species **Cliftonia monophylla** (Lamarck) Britton

Ptelea monophylla Lamarck. *Cliftonia ligustrina* Willdenow



THE Titi, also called Buckwheat-tree, Black titi and Iron-wood, is a monotype, no other species of the genus being known. It inhabits wet sandy soil and swamps from South Carolina and Georgia to Florida and Louisiana, reaching a maximum height of about 15 meters, with a trunk 5 dm. in diameter, and is one of the most beautiful trees of the southern United States. The genus is named in honor of Francis Clifton, an English physician.

The thick dark brown bark of old trees is furrowed and scaly, that of young trunks much thinner and nearly smooth. The young twigs are smooth, round and bright brown, becoming pale brown, the buds narrow and pointed. The leaves are alternate, leathery, smooth evergreen (falling toward the end of the second season), entire-margined, elliptic to oblanceolate, blunt or short-pointed,

punctate, wedge-shaped at the base, stalkless or very short-stalked, 4 to 6 cm. long, bright green and shining on the upper side, dull green beneath. The perfect and regular fragrant flowers are in racemes at the ends of twigs; the flower-stalks are subtended by small pointed thin bracts which fall away before the flower-buds open, and they bear two very small bracts below the flower; the calyx has from 5 to 8 ovate sepals which are somewhat united at the base and often unequal in size; the 5 to 8 white petals are obovate, blunt, narrowed into short claws, 3.5 to 5 mm. long, and much longer than the calyx; there are 10 stamens in two series



FIG. 569. — Titi.

of 5, the outer series longer than the inner, but somewhat shorter than the petals; the lower part of the filaments is broad and flattened, the upper part narrow; the anthers are short; the ovary is 2-winged to 4-winged and there are 2 to 4 stigmas without styles. The fruits are dry, 2-winged to 4-winged, oblong, 6 to 7 mm. long, nearly as wide as long, borne on stout nodding stalks; they resemble the fruit of buckwheat.

The wood is weak and brittle, hard, reddish brown, with a specific gravity of about 0.62, and is prized for fuel.

THE HOLLY FAMILY

AQUIFOLIACEÆ de Candolle



HIS family consists of 3 genera comprising about 290 species of small trees or shrubs of temperate and tropical regions of both hemispheres. They are of some economic value, especially the South American *Ilex paraguariensis* St. Hilaire, the leaves of which constitute the Mate, Yerba, or Paraguay tea as it is variously called, and which is of such great importance as a beverage to the inhabitants of South America on account of its tonic properties. The bark, leaves and berries of other species have also been used as astringent tonics, alteratives or emetics, especially by the North American Indians.

The *Aquifoliaceæ* have alternate, evergreen or deciduous, simple, stipulate leaves. The flowers are perfect, polygamous or diœcious, regular, mostly small and white; their calyx, which usually persists, is 3- to 6-parted; corolla of 4 to 6 imbricated, deciduous petals alternate with the sepals and often united at the base; stamens as many as the petals, their filaments erect; anthers introrse, the sacs opening lengthwise; ovary superior, 4- to 8-celled; stigma usually sessile, discoid or capitate; ovules 1 or 2 in each cavity. The fruit is a small berry-like drupe, with 4 to 8 horny or crustaceous one-seeded nutlets; endosperm fleshy and abundant; embryo cylindric.

The genus *Ilex* is the most important as well as the predominating one; another genus indigenous in our area, *Nemopanthes*, is represented by the well-known Wild or Mountain holly of the swamps of northeastern North America, *Nemopanthes mucronata* (Linnæus) Trelease, which is almost always a small shrub, but has been observed to become tree-like, 5 meters high, with a trunk 7 cm. in diameter in Sussex County, New Jersey.

THE HOLLIES

GENUS **ILEX** LINNÆUS



LEX comprises about 275 species, of which probably 22 occur in our area. Nearly all are small trees or shrubs of wide distribution. Fossil remains referable to the genus occur both in Europe and America.

They have alternate, thick, leathery or membranous, deciduous or persistent leaves with entire, toothed or spiny margins. The flowers are small, white or nearly so, in axillary clusters; the 4- to 6-lobed calyx is small and persistent; corolla wheel-shaped, its petals 4 to 6, free or partly united, oval to ob-

long, blunt-pointed, deciduous, those of the fertile flowers usually shorter than those of the sterile; filaments distinct, awl-shaped, exerted; ovary sessile, nearly cylindrical, 4- to 6-celled, rarely more, the stigmas sessile; ovules 1 or 2, suspended in each cell. The fruit is a fleshy drupe, globose, usually crowned by the withering stigmas; nutlets 4 to 8, bony or crustaceous, one-seeded; the embryo is small and erect.

This genus furnishes several highly ornamental plants. The European holly, *Ilex Aquifolium*, is a favorite for evergreen hedges in mild climates; its inner bark is made into Bird lime by a process of boiling; the leaves have also been used in medicine.

The name given to these plants by Linnæus was the ancient name of the European evergreen or Holly oak, on account of the resemblance of its leaves to those of the type species, *Ilex Aquifolium* Linnæus. Our arborescent species are:

Nutlets smooth; leaves deciduous.

Staminate and pistillate flowers both on short pedicels.

1. *I. verticillata*.

Staminate flowers on long pedicels, the pistillate on short pedicels.

2. *I. lævigata*.

Nutlets roughened; leaves deciduous or persistent.

Leaves deciduous.

Leaves mostly obovate to spatulate, broadest above the middle.

3. *I. decidua*.

Leaves mostly ovate to lanceolate, broadest below the middle.

Leaves smooth or but slightly hairy along the venation; calyx smooth without.

Leaves 4 to 7 cm. long, not strongly toothed; lowland tree.

4. *I. ambigua*.

Leaves 6 to 20 cm. long, strongly toothed; mountain tree.

5. *I. montana*.

Leaves densely hairy beneath; calyx hairy without.

6. *I. Beadlei*.

Leaves evergreen, persistent.

Leaves entire, or with a few teeth near the apex.

Leaves linear, 1 to 4 cm. long.

7. *I. myrtifolia*.

Leaves oblong to oblanceolate, 8 to 10 cm. long.

Leaves blunt; twigs dark brown.

8. *I. Cassine*.

Leaves taper-pointed; twigs white or gray.

9. *I. Krugiana*.

Leaves dentate or crenate.

Leaves crenate.

10. *I. vomitoria*.

Leaves dentate, the teeth spiny; or rarely entire with a spiny tip.

11. *I. opaca*.

1. BLACK ALDER — *Ilex verticillata* (Linnæus) A. Gray

Prinos verticillata Linnæus

Also called Inkberry, Virginia winterberry, Winterberry and Feverbush, this common shrub of swamps and wet grounds occurs from Nova Scotia to Ontario, Wisconsin, Florida and Missouri. It rarely becomes a tree, reaching a height of 7 meters.

The branches are alternate and spreading. Its bark is about 1 mm. thick, close, smooth and of a brown or gray color. The twigs are smooth or but slightly hairy, and brown. The deciduous, rather thick leaves are elliptic or oval, or sometimes ovate or obovate, 2 to 8 cm. long, sharply or taper-pointed at the apex,



FIG. 570. — Black Alder.

sharply toothed on the margin, usually smooth, but sometimes slightly hairy above, more or less densely so and prominently netted beneath; the leaf-stalk is 5 to 10 mm. long. The flowers, which open in June or July, are mostly dioecious, their calyx-lobes ovate or triangular-ovate, fringed and rather sharp-pointed; corolla whitish, 6 to 7 mm. across, the petals blunt. The fruit is in clusters, so arranged as to appear verticillate; it is globose, 6 to 8 mm. in diameter, bright red, or rarely yellowish; the nutlets are smooth.

The bark and sometimes the leaves are occasionally used in medicine as a tonic and alterative. The Black alder, on ac-

count of its brilliant fruit, is destined to become very useful in the ornamentation of large grounds where a variety of shrubbery is desired.

2. WINTERBERRY — *Ilex lævigata* (Pursh) A. Gray

Prinos lævigata Pursh

This shrub of swampy grounds and wet woods from Maine to Pennsylvania, Georgia, and Kentucky sometimes becomes a tree 6 meters tall. It is also called the Smooth winterberry and Hoopwood.

The twigs are smooth and usually dark gray. The leaves are deciduous, rather thin, elliptic, oval or lanceolate, 4 to 8 cm. long, sharply or often taper-pointed, shallowly toothed and tapering to the short slender petiole, smooth on either surface or rarely slightly hairy on the venation beneath. The flowers open in May or June. The staminate flowers are clustered on stalks 1 to 2 cm. long. The pistillate flowers are solitary on short stalks, their sepals triangular or ovate-triangular, often finely fringed on the margin and sharp-pointed; corolla white or nearly so, 6 to 7 mm. across, the petals blunt. The fruit is orange-colored or red, subglobose, 8 to 10 mm. in diameter; its nutlets are smooth.



FIG. 571. — Winterberry.

Like the foregoing, this is also very desirable for the ornamentation of large grounds in securing winter fruit effects; both grow well, however, only in moist soil.

3. DECIDUOUS HOLLY — *Ilex decidua* Walter

This small tree, or more commonly a much branched shrub, grows on the borders of swamps and streams from Virginia to Illinois, Kansas, Florida and Texas, but it does not occur in the mountains. Its maximum height is about 10 meters, with a trunk diameter of 2.5 dm. It is also called Possum haw and Bearberry holly.

The branches are spreading or ascending. Its bark, scarcely 2 mm. thick, is pale brown and warty. The twigs are round and smooth, becoming light gray. The leaves are deciduous, rather thick, usually clustered at the ends of short branches, obovate to elliptic-ob lanceolate, 2.5 to 7.5 cm. long, blunt or notched at the apex, tapering at the base, roundish toothed on the margin; they are dark green and smooth above, paler and somewhat hairy beneath; the leaf-stalk is slender, grooved, 0.5 to 1.5 cm. long and hairy. The flowers appear with the leaves, in axillary clusters, on pedicels 0.5 to 1.5 cm. long; their calyx is smooth or but slightly hairy, its lobes triangular, sharp-pointed and somewhat fringed; corolla white, 4.5 to 6 mm. across, its 4 petals obovate or nearly oblong and blunt; the stamens are shorter than the petals. The fruits are orange-colored or scarlet globose drupes 6 to 9 mm. in diameter, on short stalks, ripening in the autumn and persisting on the branches during the winter.

The wood of the Deciduous holly is hard, close-grained, yellowish white; its specific gravity is about 0.74.



FIG. 572. — Deciduous Holly.

4. CAROLINA HOLLY

Ilex ambigua (Michaux) Chapman

Prinos ambiguus Michaux. *Cassine caroliniana* Walter. *Ilex caroliniana* Trelease, not Miller

This as a small tree rarely attains a height of 6 meters; it is much more often a shrub 2 to 4 meters high.

The twigs are nearly smooth, sometimes reddish brown, but becoming dark gray or brown. The leaves are deciduous, rather thin, broadly oval to ovate, obovate or elliptic, 4 to 7 cm. long, sharp

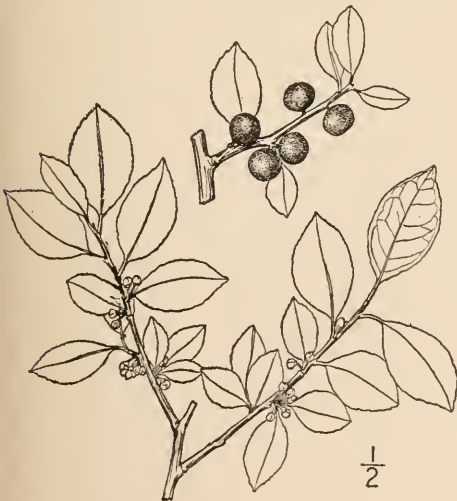


FIG. 573. — Carolina Holly.

or taper-pointed, tapering or rounded at the base, short petioled, margined with very small sharp, stiff-tipped teeth above the middle, smooth or nearly so on both surfaces. The flowers are axillary, solitary or in clusters, on pedicels 2 to 5 mm. long, opening in early spring. The calyx is 2 to 3 mm. across, smooth, its lobes broadly triangular and pointed in the staminate flowers, blunt in the pistillate, hairy-fringed; corolla white, 5 to 6 mm. across, its petals oval, blunt. The stamens are shorter than the petals. The fruit is a globose to oblong red drupe, 6 to 7 mm. in diameter; the nutlets, usually 4, are light brown and very prominently ribbed.

5. MOUNTAIN HOLLY — *Ilex montana* Torrey and Gray

Ilex monticola A. Gray

A deciduous shrub or small tree attaining a maximum height of 12 meters and a trunk diameter of 3 dm., occurring mostly in mountain woods from New York to Georgia and Alabama.

The trunk is short, its branches slender, spreading and ascending. The bark

is about 1 mm. thick, close, light brown and warty. The twigs are round, smooth, reddish brown becoming dark gray. The leaves are very thin and nearly smooth, elliptic, elliptic-lanceolate or rarely suborbicular, 6 to 20 cm. long, taper-pointed, narrowed or rounded at the base, sharply toothed on the margin, dark green and smooth above, paler and smooth, except for a few hairs along the prominent venation, beneath. The flowers appear from May to August, in clusters on short, lateral stalks, the staminate on pedicels 12 mm. long, the pistillate solitary or few in a cluster, on short pedicels. The calyx is 3 to 4 mm. across; its lobes are



FIG. 574. — Mountain Holly.

broadly triangular, irregularly toothed, sharp-pointed and ciliate; corolla white, 6 to 8 mm. across, its lobes oval to obovate and blunt; stamens shorter than the corolla-lobes. The fruit is a scarlet globose drupe about 12 mm. in diameter, crowned with the large stigma; the nutlets are strongly ribbed.

The wood is hard, close-grained, nearly white; its specific gravity is about 0.66. It takes kindly to cultivation and is a desirable addition to decorative shrubbery on account of its bright foliage and brilliant fruit.

6. BEADLE'S HOLLY — *Ilex Beadlei* Ashe

Inhabiting rocky woods of the mountainous portions of North Carolina, Tennessee, and Alabama, and usually a shrub, this sometimes becomes a small tree.

The twigs are round, quite smooth, and brownish or dark gray. The deciduous leaves are membranous, often crowded, elliptic, ovate or suborbicular, broadest either about or below the middle, 3 to 8 cm. long, sharp or taper-pointed, rounded or tapering at the base, and sharply toothed on the margin; they are light green and finely hairy above, paler and densely hairy with prominent midrib beneath; the leaf-stalks are about 1 cm. long and hairy. The flowers are on short hairy pedicels in few-flowered clusters; the calyx is hairy, about 2 mm. broad, its lobes blunt; the corolla is 5 to 6 mm. across. The fruit is a bright red drupe, oblong-globose, 6 to 8 mm. long; the nutlets are strongly ribbed.

This may be a hairy form of the preceding species.



FIG. 575. — Beadle's Holly.



FIG. 576. — Myrtle Leaved Dahoon.

7. MYRTLE LEAVED DAHOON

Ilex myrtifolia Walter

This straggling shrub sometimes becomes a tree with an ascending or curved trunk, and stiff, upright, slender branches. It occurs in cypress swamps and wet woods in the pinelands of North Carolina to Florida and Louisiana. Its maximum height is 9 meters, with a trunk diameter of 3 dm.

The bark is thin and nearly white. The twigs are slender, gray to brown, and nearly smooth. The leaves are thick, leathery and persistent, narrowly oblong or linear, or on vigorous shoots nearly oval, 1 to 4

cm. long, bristle-pointed, tapering to the base, entire and somewhat revolute on the

margin, dark green and smooth above, pale and usually smooth beneath, the leaf-stalk about 2 mm. long. The flowers are solitary, or in few-flowered clusters, and open from April to June. The calyx-lobes are triangular and sharp-pointed; corolla white, 4 to 5 mm. across, its 4 lobes obovate or oval and blunt; stamens 4, shorter than the corolla. The fruit is globose, red, about 6 mm. in diameter, on stalks about 5 mm. long; the nutlets are prominently ribbed on both surfaces.

The wood is soft, close-grained and very light brown; its specific gravity is about 0.59. The plant has been regarded as a variety of *Ilex Cassine*, but seems to be distinct.

8. DAHOON — *Ilex Cassine* Linnaeus

Ilex Dahoon Walter

A small evergreen tree or shrub, also called Yaupon and Dahoon holly; it grows in swamps and on stream banks in the coastal regions from Virginia to Florida and Louisiana, attaining a maximum height of 9 meters, with a trunk diameter of 4.5 dm., and slender spreading and ascending branches. It occurs also in the northern Bahama islands and in Cuba.



FIG. 577. — Dahoon.

The bark is about 2 mm. thick, close, and dark gray. The twigs are comparatively stout, densely silky-hairy for several years, becoming smooth and dark brown. The leaves are persistent, leathery, oblanceolate or oblong, rarely obovate, 4 to 10 cm. long, sharp, blunt or notched at the apex, gradually tapering to the base, somewhat revolute on the entire or sparingly toothed margin, dark green, shining and smooth above, pale and sometimes hairy beneath; the leaf-stalk is 5 to 10 mm. long, grooved and usually hairy. The flowers are in simple or paniced, umbel-like clusters, the peduncle 3 to 20

mm. long and hairy, the pedicels short. The calyx is 1.5 to 2 mm. across, its lobes triangular ovate, toothed and fringed, usually sharp-pointed; corolla white, 4 to 4.5 mm. across, its lobes obovate and blunt; stamens usually shorter than the corolla-lobes. The fruit remains on the twigs all winter; it is globose, bright red or yellowish, 6 to 8 mm. in diameter, on short hairy stalks; nutlets ribbed.

The wood is soft, close-grained, weak and light brown; its specific gravity is about 0.48.

9. KRUG'S HOLLY — *Ilex Krugiana* Læsenr

This West Indian evergreen tree has recently been discovered in southern peninsular Florida by Dr. J. K. Small and Mr. Percy Wilson, growing in rich hammocks south of Miami, attaining a height of about 15 meters, with a trunk diameter of 3 dm. In the Bahamas it is called Whitewood and it grows also in Haiti.

The twigs are round, gray, becoming white. The bark is thin, close, quite smooth and nearly white. The leaves are elliptic, elliptic-ovate or ovate-lanceolate, 5 to 10 cm. long, taper-pointed, rounded or narrowed at the base, entire and revolute on the margin, yellowish green, smooth and shining with impressed midrib above, dull and smooth with prominent midrib beneath; the leaf-stalk is 1.5 to 2 cm. long, slender and grooved. The flowers are in axillary clusters; peduncles about 1 cm. long, the pedicels very short. The calyx is about 2 mm. broad, with



FIG. 578. — Krug's Holly.

triangular, sharp-pointed lobes; corolla whitish, spreading, 2.5 mm. across, its lobes ovate and spreading; ovary ellipsoid; stigma discoid, slightly 4-lobed. The fruit is a globose, brownish purple drupe, its stalk 5 to 10 mm. long; nutlets usually 4, dark brown, rough, scarcely ridged.

10. CASSENA — *Ilex vomitoria* Aiton

Ilex Cassine Walter, not Linnæus

Usually an evergreen shrub, this sometimes becomes a tree up to 8 meters tall, with a trunk diameter of 2 dm., often forming dense thickets along margins of swamps and streams from Virginia and Arkansas to Florida and Texas, mostly near the coast. It has become naturalized in Bermuda.

The ascending branches are slender. The bark is 1.5 to 3 mm. thick, broken into small scales of a light reddish brown color. The stiff, widely spreading twigs are finely hairy, but become smooth, and pale gray. The leaves persist for 2 or 3 years, are leathery, oblong, oval or elliptic, 1 to 2.5 cm. long, blunt at the

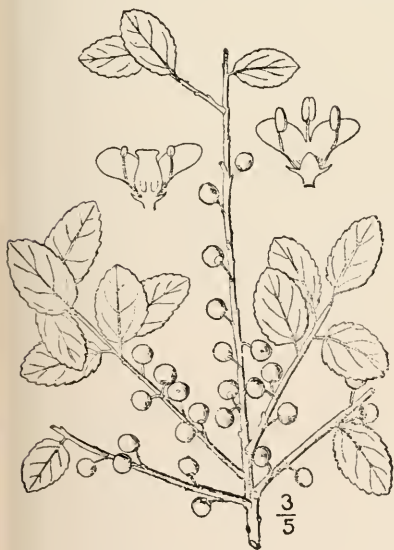


FIG. 579. — Cassena.

apex, abruptly tapering to a short, grooved stalk; the margin is toothed; they are



FIG. 580. —Holly, Washington, D.C.

deep green and shining above, paler beneath. The flower clusters are short-stalked on the staminate plant, but quite sessile on the pistillate, the smooth pedicels 3 to 6 mm. long; the 4 calyx-lobes are triangular-ovate and blunt; corolla white, 5.5 mm. across, its lobes oval or obovate and blunt. The fruit is a dark red globose drupe, 5 to 6 mm. in diameter on a short stalk; the nutlets are but slightly ribbed.

The wood is hard, close-grained, nearly white; its specific gravity is about 0.73. The branches with their brilliant fruit are used in winter decoration like those

of the American holly, but not as extensively. In the form of a decoction the leaves were used by the Indians as an emetic and purgative.

It is also called Yaupon, Yopon, Cassena tree, Evergreen cassena, Cassioberry bush, and Emetic holly.

II. AMERICAN HOLLY — *Ilex opaca* Aiton

This handsome evergreen tree is also called White holly; it occurs in moist woodlands or on dryish hillsides near the coast from Maine to Florida, in the Gulf States to Texas, and up the Mississippi valley to Missouri and southern Indiana. Its maximum height is 15 meters, with a trunk diameter of 1 meter.

The branches are slender, spreading and ascending, forming a conic tree. The bark is up to 12 mm. thick, close, white or grayish. The twigs are finely rusty hairy, soon becoming smooth and light brown. The leaves are stiff and leathery, oval, elliptic or obovate, 4 to 10 cm. long, the apex and marginal teeth spine-tipped, rarely nearly entire; they are dark green, smooth and shining above, pale, smooth and dull beneath; the petiole is short. The flowers, the two kinds usually on different individuals, open from April to June, the staminate 2 to 9 on a common stalk; the pistillate flowers are usually solitary; the calyx-lobes are triangular, about 1 mm. long, finely fringed and sharp-pointed; corolla 5.5 to 6.5 mm.



FIG. 581. — American Holly.

across, its lobes oblong and blunt; the stamens of the staminate flowers exceed the corolla, but in the pistillate flowers they are shorter. The fruit is a bright red drupe, rarely yellow, about 1 cm. in diameter, smooth and shining; it remains on the branches throughout the winter; nutlets light brown, with few but prominent ribs.

The wood is tough, rather weak, very close-grained, and white; its specific gravity is about 0.58. It is used for furniture, cabinet work, interior finishing, and in turnery, for which its whiteness and compactness make it very desirable.

Immense quantities of the branches, with their bright red berries and clear green foliage, are used during the winter holidays for decorative purposes. As an ornamental tree it is strikingly beautiful, but it grows slowly and is not often seen in cultivation.

THE STAFF TREE FAMILY

CELASTRACEÆ Lindley



HIS family comprises about 40 genera, with some 350 species of trees, shrubs, or woody climbers of wide geographic distribution, but most abundant in the tropics. They are of no especial economic value; a few have medical properties and many are quite ornamental.

The Celastraceæ have simple, deciduous or persistent, alternate, opposite or whorled leaves, with or without stipules. The flowers are small and inconspicuous, usually in cymes, sometimes otherwise clustered, perfect or imperfect, regular, generally on short jointed pedicels; the calyx is persistent, 4- or 5-lobed or parted, the corolla is of 4 or 5 petals, inserted under the margin of the flat or lobed disk; stamens 4 or 5, inserted upon or under the disk, their anthers introrse; ovary sessile, 2- to 5-celled, the styles short and thick or wanting; stigma capitate, entire or 2- to 5-lobed; ovules, or 2 in each cell. The fruit is a capsule, drupe or berry, sometimes winged; seeds solitary or several in each cell, often enclosed in a bright-colored aril; endosperm copious, fleshy or oily; embryo straight.

The well-known woody climber, known as False bittersweet, *Celastrus scandens* Linnæus, is a member of this family. The arborescent genera in our area are;

Fruit a dehiscent capsule.

1. *Euonymus*.

Fruit indehiscent, drupaceous or berry-like.

Flowers perfect; ovary 4-celled.

2. *Rhacoma*.

Flowers diœcious; ovary 2-celled.

Leaves opposite; ovules pendulous.

3. *Gyminda*.

Leaves alternate; ovules erect.

4. *Schæfferia*.

I. WAHOO

GENUS **EUONYMUS** [TOURNEFORT] LINNÆUS

Species ***Euonymus atropurpureus*** Jacquin



EUONYMUS includes about 65 species of shrubs and small trees, mostly natives of the north temperate zone, a few, however, occurring in the East Indies and one in Australia. There are about 6 species in the United States, of which the Wahoo is the only one which forms a tree, and there are several in Mexico. The generic name is the ancient Greek appellation of the type species, the European Spindle-tree (*Euonymus Europæus* Linnæus), which is much planted for ornament in North America, and occasionally escapes from cultivation. The species of *Euonymus* have opposite, stalked, simple

leaves, with very small stipules which fall away early. The rather small flowers are in stalked axillary cymes, and are either perfect or polygamous; the calyx is 4-lobed or 5-lobed; there are 4 or 5 petals, as many stamens, and the ovary is from 3-celled to 5-celled, usually with 2 ovules in each cavity; the style is short and there are as many stigma-lobes as ovary-cavities. The fruit is a more or less fleshy lobed capsule, splitting into valves when ripe, the seeds with a large red or purple aril.

The Wahoo, known also as Burning bush and Indian arrow, while often a shrub, locally becomes a tree 8 or 9 meters high, with a trunk 2 dm. thick. It grows in woodlands and thickets from Ontario to Pennsylvania, Florida, Montana, the Indian Territory, and Arkansas. Its bark is gray and ridged; the young twigs are smooth, bluntly angled,



FIG. 582. — Wahoo.

slender and green, becoming round and purplish brown; the buds are purple, 3 or 4 mm. long. The leaves are ovate-oblong to elliptic, 4 to 13 cm. long, pointed, thin, finely hairy on the under side, darker green and smooth on the upper, narrowed or sometimes rounded at the base, finely toothed, strongly pinnately veined; the leaf-stalks are 8 to 20 mm. long. The flower-clusters are long-stalked; the flowers are deep purple, about 12 mm. wide, and open in May or June; their parts are usually in 4's, the obovate wavy-margined petals much longer than the calyx-lobes and stamens. The fruit is deeply 4-lobed, rarely 3-lobed, 12 to 16 mm. broad, purplish, its valves hanging on the twigs into the winter.

The wood is nearly white, hard and dense, with a specific gravity of about 0.66. The bark of the stem and root is used in medicine. Local names are Spindle tree, Strawberry tree, Arrowwood, and Bleeding heart.

II. RHACOMA

GENUS *RHACOMA* LINNÆUS

Species *Rhacoma Crossopetalum* Linnæus

Myginda Rhacoma Swartz. *Crossopetalum austrinum* Gardner



SHRUB or small tree widely distributed in the West Indies, and growing in sandy soil in southern peninsular Florida and on the Keys, where it reaches the height of 6 meters; it is the type species of the genus.

It has a smooth, pale bark and 4-angled brownish or ashy-gray twigs. The

FIG. 583. — *Rhacoma*.

leaves are opposite or in whorls, ovate, obovate, oblong or elliptic, 1 to 4 cm. long, blunt or acutish or notched at the apex, narrowed and tapering at the base, the margin bluntly toothed at least toward the apex; they are light green and smooth above, paler with prominent midrib beneath; the leaf-stalk is about 2 mm. long. The flowers are very small, perfect, in the axils of the leaves, in slender-stalked clusters, appearing in spring; their urn-shaped calyx has 4 roundish lobes; petals 4, inserted under the flattened 4-lobed disk, oval and reflexed; stamens 4, inserted between the lobes of the disk; ovary 4-celled, merging into the disk; stigmas 4; ovules solitary and erect in each cavity. The fruit is a red, slightly oblique drupe 5 to 6 mm. long, with a bony stone.

The genus consists of 10 or more species, mostly shrubs, of the warmer portions of the New World. One other species, a small, straggling, or prostrate shrub, with spiny-toothed leaves, also grows in southern Florida.

The name is supposed to be from *Rha*, the old name of the Volga, and was used by Pliny for some Old World plant.

III. FALSE BOXWOOD

GENUS **GYMINDA** [GRISEBACH] SARGENT

Species ***Gyminda latifolia*** (Swartz) Urban

Myginda latifolia Swartz. *Gyminda Grisebachii* Sargent

GYMINDA, as now known, consists of 2 species, one here described, the other Costa Rican. They are evergreen trees with simple opposite leaves, and small greenish imperfect flowers, in small axillary clusters, the pistillate on one plant, the sterile on another. The calyx has 4 small lobes; there are 4 petals much longer than the calyx; the staminate flowers have 4 stamens about as long as the petals and a minute abortive ovary; the fertile flowers



FIG. 584. — False Boxwood.

have a 2-celled ovary with 1 pendulous ovule in each cavity. The fruit is a small drupe. The name *Gyminda* is an anagram of *Myginda*, to which genus the following species was first referred.

Gyminda latijolia, the type of the genus, grows in southern Florida, the Bahamas, Cuba, and Porto Rico. It attains a maximum height of about 9 meters, with a trunk 2 dm. in diameter or less. Its bark is reddish brown and thin. The young twigs are sharply 4-angled and smooth, becoming round and gray. The leaves are obovate-oblong, thick, slightly toothed or entire-margined, blunt or sometimes notched at the apex, narrowed at the base, very short-stalked, 2 to 5 cm. long, paler green on the under side than on the upper. The flowers open from February to June. The drupe is nearly black, oblong, 6 to 8 mm. long.

The wood is dense, very dark brown, with a specific gravity of about 0.90.

IV. FLORIDA BOXWOOD

GENUS **SCHÆFFERIA** JACQUIN

Species ***Schæfferia frutescens*** Jacquin



CHÆFFERIA contains 5 species, one a low shrub of Texas and adjacent Mexico, a tree of subtropical America, here described, which, however, also grows commonly as a shrub, and three other West Indian shrubs. They have alternate persistent entire-margined leaves and small imperfect flowers, clustered or solitary in the axils, the staminate on one



FIG. 585. — Florida Boxwood.

plant, the pistillate on another. The 4-lobed calyx is very much shorter than the 4 petals; there are 4 slender stamens and a rudimentary ovary in the staminate flower; in the pistillate flower the 2-celled ovary has one erect ovule in each cavity, and is surmounted by a short style and a 2-lobed stigma. The fruit is a small

drupe, grooved on each side, containing two seeds. The genus is named in honor of J. C. Schæffer, a German naturalist, who died in 1790.

Schæfferia frutescens, the type of the genus, inhabits southern Florida and the West Indies from the Bahamas to Jamaica and Barbados, occurring also in Central America and South America. It is also known also as Yellow-Wood in Florida, and sometimes forms a tree 14 meters high, with a trunk 2.5 to 3 dm. thick. The very thin bark is light gray and slightly grooved, the young twigs ridged and angled, yellow-green, becoming round and light gray. The leaves are obovate to oblong or spatulate, pointed, blunt or rarely notched, leathery, veiny, 2.5 to 6 cm. long, narrowed at the base and short-stalked. The flowers are about 3 mm. wide, and open in Florida in February and March, but in the West Indies the flowering period extends to August. The fruit is 4 to 6 mm. long, bright red, tipped by the persistent style, unpleasant to the taste.

The wood is yellow, dense, with a specific gravity of about 0.77.

THE CANOTIA FAMILY

CANOTIACEÆ Britton

GENUS **CANOTIA** TORREY

Species **Canotia holacantha** Torrey



ANOTIA is a curious and interesting monotype, whose botanical relationships are not very evident. It occurs only, so far as known, in Arizona and southern California, and is a leafless tree or shrub; its twigs are tipped by stiff spines. It has been regarded by authors at different times as belonging to three different natural families, and is here considered as sufficiently distinct from everything else to constitute a family all by itself, the Canotiaceæ. The generic name, given by Dr. Torrey, is what it was called by the Mexicans when discovered by Dr. Bigelow in 1854.

The brown bark is deeply channelled, the twigs and spines round and smooth; there are characteristic black markings at the base of each twig and at the bases of the small flower-clusters, which are borne on the sides of twigs and subtended by a very small ovate pointed scale. The flowers, which open from June to October, are perfect and regular, white, about 8 mm. broad; the calyx is very small and 5-lobed; the 5 petals are oblong-ovovate and blunt, alternating with as many short stamens; the ovary is 5-celled with about 6 ovules in each cavity, the style long, the small stigma slightly 5-lobed. The fruit is a dry oblong capsule, about 2.5 cm. long, with a slender tip, and splits when ripe into 5 woody valves, releasing the flat and winged seeds.

The wood is hard, dense, light brown, with a specific gravity of about 0.67.



FIG. 586. — Canotia.

THE BLADDERNUT FAMILY

STAPHYLEACEÆ de Candolle



HIS family includes some 5 genera, with probably 25 species of trees or shrubs of wide geographic distribution. They are of no economic value, but are sometimes planted for ornament.

The Staphyleaceæ have mostly opposite, rarely alternate, odd pinnate or trifoliolate leaves. The flowers are regular and perfect, disposed in racemes or panicles, terminal or axillary; the calyx is composed of 5 sepals, the corolla of the same number of petals, which are longer than the sepals and imbricated; stamens 5, inserted under the edge of a cup-like disk, their filaments distinct; anthers 2-celled, introrse; the ovary, of 2 or 3 partly united carpels, is sessile, its 3 styles are distinct or united; stigmas simple; the ovules are borne in one or two rows. The fruit is an inflated bladder-like membranous capsule, or berry-like or drupaceous in some exotic genera; the seed is hard and bony, usually shining, with scant fleshy endosperm and a straight embryo.

There is one genus with 2 species of shrubs in our area, one of which occasionally becomes arborescent.

BLADDERNUT

GENUS **STAPHYLEA** LINNÆUS

Species **Staphylea trifoliata** Linnæus



BLADDERNUT is a well-known shrub, frequent in thickets from Quebec to Minnesota, southward to Georgia and Arkansas; it has recently been reported as being arborescent in Floyd county, Georgia, and in Montgomery county, Alabama, by Dr. Roland M. Harper, attaining the height of 9 meters, with a trunk diameter of 1.5 dm. As a shrub it often reaches a height of 5 meters.

The bark is smooth, and striped with light green or white. The twigs are slightly angular, pithy, light green and more or less shining, becoming dark brown, dull, and profusely striped with white. The buds are broadly ovoid, about 3 mm. long, covered by broad smooth scales. The leaves are opposite, trifoliolate, the leaflets being ovate, elliptic or obovate, 5 to 10 cm. long, usually taper-pointed, finely toothed on the margin, the lateral pair unequally rounded or narrowed at the base, the terminal one equal and stalked; they are hairy at first, soon becoming nearly smooth and bright green above, paler and slightly hairy beneath; the stipules are linear, 8 to 12 mm. long, tinged with red, and soon fall off. The bell-

shaped flowers are in axillary drooping panicles 5 to 10 cm. long, white and rather showy; the pedicels are jointed at or above the middle, 8 to 12 mm. long; the 5 sepals are lanceolate to oblong, 7 to 10 mm. long, blunt and smooth; the 5 petals are spatulate, slightly longer than the calyx; stamens 5, their filaments about equal



FIG. 587. — Bladdernut.

in length to the petals and hairy. The fruit is a dry inflated bladder-like, ovoid capsule 4 to 6 cm. long, 3-lobed, and notched at the apex; seeds few, about 3 mm. long, light brown and shining.

The generic type is *Staphylea pinnata* Linnæus, of Europe; the name is Greek, in reference to the flower clusters. There is one other species in our area, the California bladdernut, *Staphylea Bolanderi* A. Gray. The European bladdernuts, *Staphylea colchica* Stevan, and *S. pinnata* are occasionally seen in parks and on lawns.

THE MAPLE FAMILY

ACERACEÆ Saint Hilaire



HIS family consists of but 2 genera, the Asiatic *Dipteronia* of Oliver, and the Maples, including in all about 100 species of trees or shrubs, many of which contain a saccharine sap which upon concentration becomes the favorite Maple syrup, or on solidification is known as Maple sugar. The timber of the maples is also highly valued. As ornamental and shade trees they are probably more used than any other single genus of our flora.

The *Aceraceæ* have opposite, simple leaves, which are usually palmately lobed, rarely entire or pinnate. The flowers are regular, polygamous or diœcious, borne in axillary or terminal corymbs or racemes. The calyx is usually 5-parted, mostly colored and deciduous; the disk, if any, is cup-shaped, usually lobed; corolla wanting or, if present, consisting of the same number of petals as there are calyx-lobes and alternate with them; stamens as many as the calyx-lobes, or often 8, their filaments thread-like, distinct, sometimes very short; anthers introrse, versatile; ovary free, 2-lobed and 2-celled; styles 2, usually united; stigma 2-cleft. The fruit usually consists of 2 long-winged samaras with nut-like bases; seed 1, rarely 2, compressed, without endosperm; the embryo has thin cotyledons.

Our arborescent forms are best treated as one genus, although some authors group the Box elders, or Ash-leaved maples, the compound-leaved species, into another genus under the name *Rulac* Adanson or *Negundo* Mœnch.

THE MAPLES

GENUS **ACER** [TOURNEFORT] LINNÆUS



CER comprises nearly 100 species of trees or shrubs, with few exceptions confined to the northern hemisphere, throughout which they are widely distributed. Numerous fossil species have also been described.

The name is the ancient Celtic name of the Maple, *A. Pseudo-Platanus* Linnæus being the type. The following North American trees are known:

- A. Leaves simple, palmately or radiately veined.
- a. Flowers in terminal racemes, panicles or corymbs, unfolding after the leaves, or with them.
- *Flowers paniced or racemose.

Inflorescence erect; petals linear to linear-spatulate, 2 or 3 times as long as the sepals; small tree or shrub.

Inflorescence drooping; petals oblong to obovate, about as long as the sepals.

Ovary and fruit glabrous; leaves 3-lobed toward the apex; small eastern tree.

Ovary and fruit hirsute; leaves deeply 5-lobed; large western tree.

**Flowers corymbose or short-racemose; western trees and shrubs.

Petals much shorter than the purple sepals.

Petals about as long as the sepals.

Samaras diverging at 180 degrees.

Samaras ascending or erect.

Terminal leaf-lobe rhombic.

Terminal leaf-lobe ovate.

b. Flowers in lateral umbel-like clusters, expanding with the leaves or before them.

Flowers expanding before the leaves, their pedicels not drooping.

Petals obsolete or none; calyx 5-toothed; ovary pubescent.

Petals present; sepals nearly distinct; ovary glabrous.

Leaves nearly glabrous beneath, or somewhat pubescent; samaras less than 4 cm. long.

Leaves bright green above, pale green or whitish beneath.

Wing of the samara broadened above the middle.

Wing of the samara linear, scarcely widened above.

Leaves dark green above, pale beneath, mostly 3-lobed.

Leaves persistently woolly beneath, at least along the veins; samaras mostly 4 cm. long or longer.

Flowers expanding with the leaves, their pedicels drooping.

Eastern trees; leaves large.

Bark of trunk gray to black; samaras mostly 3 cm. long or longer.

Leaves pale or glaucous beneath, not stipulate, their lobes coarsely toothed.

Leaves green on both sides, often stipulate, their lobes entire or undulate.

Bark white; samaras mostly less than 3 cm. long.

Leaves glaucous and sometimes pale-pubescent beneath; samaras green.

Leaves green and velvety beneath; samaras red.

Rocky mountain tree; leaves small, their lobes coarsely toothed.

B. Leaves pinnately compound, often trifoliate (Ash-leaved Maples).

United part of the samaras distinctly constricted at the base, stipe-like; leaves thin; eastern tree.

United part of the samaras not constricted at the base, or but slightly constricted; leaves firm; western trees.

Foliage densely pubescent; Californian tree.

Foliage not densely pubescent.

Samara-wing adnate to the body only to or above the middle

Samara-wing adnate to the body down to the point of coherence; Utah tree.

1. *A. spicatum*.

2. *A. pennsylvanicum*.

3. *A. macrophyllum*.

4. *A. circinatum*.

5. *A. modocense*.

6. *A. glabrum*.

7. *A. Douglasii*.

8. *A. saccharinum*.

9. *A. rubrum*.

10. *A. stenocarpum*.

11. *A. carolinianum*.

12. *A. Drummondii*.

13. *A. Saccharum*.

14. *A. nigrum*.

15. *A. floridanum*.

16. *A. leucoderme*.

17. *A. grandidentatum*.

18. *A. Negundo*.

19. *A. californicum*.

20. *A. interior*.

21. *A. Kingii*.

1. MOUNTAIN MAPLE — *Acer spicatum* Lamarck

More often a shrub than a tree, this plant grows in rocky woods from Newfoundland to James bay and Manitoba, south, especially along the mountains to Georgia, Tennessee, Michigan, and Minnesota. It sometimes attains a height of about 10 meters, with a trunk diameter of about 2 dm.

Its bark is thin and brown or grayish brown. The young twigs are finely hairy, red in winter and brown in summer. The leaves are quite thin, long-stalked, the blade 7 to 13 cm. long, and nearly or quite as wide, 3-lobed or sometimes 5-lobed, usually cordate at the base, the lobes pointed, coarsely toothed nearly all around with gland-tipped teeth, very hairy beneath and somewhat hairy above when young, but smooth on the upper side and sparingly hairy beneath when mature. The flowers are in long, upright hairy stalked compound racemes at the ends of the branches, and open in May or June after the leaves are nearly fully developed, the sterile flowers in the upper part of the clusters, the pistillate ones below; the calyx is very small and hairy; the yellow-green petals are linear-spatulate, about 1.5 mm. long; the stamens of the sterile flowers are longer than the petals, while those of the fertile ones about equal the petals in length. The clusters of ripe red fruit droop; the samaras are about 2 cm. long, their wings divergent or ascending, the seed-bearing part strongly striated, the wing 6 to 8 mm. wide.



FIG. 588. — Mountain Maple.

The tree is too small for its wood to be of commercial importance; it has a specific gravity of 0.53, and is brown. It is sometimes planted for ornament, but needs shade of other trees for its successful cultivation in places where the summers are hot.

2. STRIPED MAPLE — *Acer pennsylvanicum* Linnæus

The striped maple, perhaps more generally called Moosewood, because moose and deer feed on its young shoots, is an inhabitant of woods and forests from Nova Scotia through Quebec and Ontario to Michigan and Minnesota, extending south, especially along the mountains, to Georgia and Tennessee. Like the Mountain maple it commonly flowers as a shrub; as a tree it reaches about 13 meters in height, with a trunk diameter of about 2.5 dm.

The bark is thin and reddish green, striped with lighter colored bands or lines. The young twigs are yellow-green in summer and red-brown in winter. The leaves are large, often 2 dm. long, and nearly or quite as wide, broadest above the middle, thin, soon collapsing after being picked, 3-lobed at or above the middle,

finely toothed all around, hairy when very young but at maturity smooth above, paler and nearly smooth beneath, the short lobes long-pointed. The flowers are borne in long nodding stalked racemes at the ends of the branches, the sterile and fertile ones usually in different clusters but on the same plant; the narrow yellow-green sepals are about as long as the obovate or spatulate bright yellow bluntish petals; the stamens of the sterile flowers are nearly as long as the petals, those of the fertile flowers very short. The widely divergent samaras are smooth, 2 to 2.5 cm. long, the wing 8 to 10 mm. wide.

The tree is of great beauty and adapted to lawn and park planting in shaded situations; its wood is light brown, with a specific gravity of 0.52. It is also called Striped dogwood, Whistle wood and Pigeonwood.



FIG. 589. — Striped Maple.

3. BROAD-LEAVED MAPLE — *Acer macrophyllum* Pursh

A forest tree of the Pacific coast, attaining a height of at least 32 meters and a trunk diameter of about 1 meter, and ranging from southern Alaska to southern California, and known also as White maple.



FIG. 590. — Broad-Leaved Maple.

very prominent beneath, the pointed lobes wavy-margined, coarsely toothed, or again lobed. The flowers are in long, drooping racemes at the ends of the

The furrowed brown bark is scaly and rather thick. The twigs are quite smooth, at first light green, red in the winter and subsequently gray. When unfolding, the leaves are densely hairy, but soon become smooth above, and at maturity have only a few hairs in tufts at the axils of the veins beneath; they are nearly orbicular in outline, or somewhat wider than long, the petiole often as long as the blade, the latter deeply 5-lobed, or sometimes 3-lobed, cordate at the base, rather leathery and 2 to 3 dm. across when fully grown, dark green and somewhat shining above, paler and with the veins

branches, and appear in spring after the leaves are grown, both sterile and fertile ones usually in the same clusters; the sepals are obovate, blunt, yellow, and about as long as the narrower yellow petals; in the sterile flowers the stamens are nearly twice as long as the petals; in the pistillate flowers they are very short. The samaras vary from 4 to 6 cm. in length; the somewhat divergent wings are 1 to 2 cm. wide, and the seed-bearing part is densely covered with long hairs.

The tree is hardy as far north as southern New York, but does not succeed very well in eastern North America, while doing splendidly in European parks. Its wood furnishes a very valuable lumber, with specific gravity of about 0.49; it is soft and reddish brown, and is extensively used in the West for furniture and in carpentry.

The Sycamore Maple, *Acer Pseudo-Platanus* Linnæus, attaining a height of 24 meters, a rapid growing shade tree introduced from Europe, is a beautiful tree, occasionally spontaneous, especially about our eastern cities. Its 5- to 7-lobed leaves are coarsely round- or blunt-toothed, shallowly heart-shaped at the base, 8 to 15 cm. broad, dark green and smooth above, pale, glaucous and hairy on the broad veins beneath. The flowers appear in June in many-flowered, pendulous racemes. Its fruit is large and smooth.

4. VINE MAPLE — *Acer circinatum* Pursh

The common name Vine maple refers to the trailing or half-climbing habit of this interesting tree, which grows naturally along streams and lakes, often forming almost impenetrable thickets, from British Columbia to northern California, mainly near the coast. It is often shrubby in habit, but sometimes forms trunks 12 to 15 meters long and 1 dm. thick. It is known also as Mountain maple.



FIG. 591. — Vine Maple.

Its bark is reddish brown, thin and nearly smooth. The young twigs are smooth, green to red-brown, sometimes covered with bloom. The petioles of the leaves are shorter than the blades; the leaves are quite silky-hairy when young, but are smooth at maturity, except for a few long silky hairs at the base of the blade on the under side; the blades are orbicular in outline, or somewhat wider

than long, thin, bright green on both surfaces, but a little paler beneath than above, 5 to 15 cm. across, or those of young shoots larger, cordate or sometimes nearly truncate at the base, digitately 5-lobed to 9-lobed, the lobes lanceolate, sharp-pointed, and sharply toothed. The sterile and fertile flowers are borne together in nodding corymbs at the ends of the twigs, and open from April to June, while the leaves are still young; the oblong pointed red or purple sepals are provided with long silky hairs; the hooded greenish petals are much shorter than the

sepals, but they are longer than the stamens in the pistillate flowers, while the stamens of the sterile flowers are much longer than the sepals. The samaras are smooth, soon red, and diverge from each other as widely as is possible; they are about 3 cm. long, the wing 8 to 15 mm. wide.

The wood is used in small quantities for the handles of tools; it is hard, light brown, with a specific gravity of 0.67. The tree succeeds well in cultivation and is of great beauty. Professor Greene has described *Acer Macounii*, from specimens collected by Mr. J. M. Macoun, in British Columbia, as distinct from the Vine Maple.

5. MODOC MAPLE — *Acer modocense* Greene

This recently described tree is a native of northern California, related to the Vine maple, but apparently distinct from it, though known as yet only from a few specimens.

The bark of twigs is smooth, faintly shining, light brown. The leaves are thin, nearly orbicular in outline, 5 to 6 cm. broad when mature, with 5 radiating ovate lobes which are pointed and sharply irregularly toothed; the leaf-surfaces are nearly equally light green on both sides, the under surface somewhat hairy on the veins and at the end of the slender smooth stalk, which is from 2 to 3 cm. in length. The small flowers are described as green or greenish white, the sepals oval and but little longer than the petals. The samaras diverge nearly at



FIG. 592. — Modoc Maple.

180°, the seed-bearing part plump, strongly nerved, 5 mm. long, and nearly as thick as long, the oblong blunt wing nearly 2 cm. long and about 8 mm. wide.

6. DWARF MAPLE — *Acer glabrum* Torrey

This small tree or shrub occurs along streams and on hillsides from Montana and Idaho to Wyoming, western Nebraska, throughout Colorado to New Mexico and Arizona, and also in the Sierra Nevada Mountains of California. It is planted a maximum height of only about 8 meters, and its trunk is not 12 dm. in thickness. It is also called Sierrubby maple.

Its bark is thin and red-brown. The twigs are smooth and come red-brown; the long-stalked thin leaves are green when very young, nearly orbicular in outline.



FIG. 593. — Dwarf Maple.

across, 3-lobed or 5-lobed, or often 3-parted, rather dark green above, and apple-green on the under side, the lobes pointed or blunt, sharply toothed, the middle lobe narrowed at the base, rhombic in outline. The flowers are mostly dioecious, in small sessile or short-stalked corymbs or corymb-like racemes, opening in May; the sepals are blunt, oblong or oblong-spatulate, petal-like; the petals are oblong or linear-oblong, yellow-green, and vary from half as long to about the length of the sepals; the stamens, even those of the sterile flowers, are not longer than the sepals; the samaras are smooth, shining, 1.5 to 3 cm. long, more or less diverging, the wing 8 to 12 mm. wide.

The wood is close-grained, light brown and hard, with a specific gravity of about 0.60; it is not of commercial importance.

7. DOUGLAS' MAPLE — *Acer Douglasii* Hooker

Douglas' maple much resembles the Dwarf maple, and has been considered by several authors as not at all different from that species, but a study of many specimens of both leads us to regard the two as distinct. It ranges from Alaska through British Columbia to Alberta, Montana, Idaho, and Oregon. While usually a bush, it sometimes attains the habit of a tree and reaches a height of about 10 meters.

The bark is smooth and red-brown, the twigs purple. The leaves differ from those of the Dwarf maple in being relatively large, often 8 to 10 cm. across, and as a rule are less lobed, although sometimes the middle lobe is, how-



FIG. 594. — Douglas' Maple.

ever, the middle lobe is, how-
ever, little or not at all narrower at the base than above it; the leaves are sharply toothed all around, pale green beneath, dark green above. The yellow dioecious flowers are borne in short corymb-like racemes. The leaves are partly grown; the stamens of the flowers have spatulate or nearly linear sepals and petals.

The samaras are smooth, 2 to 3 cm. long, the erect or more or less divergent wings 8 to 13 mm. wide.

8. SILVER MAPLE — *Acer saccharinum* Linnaeus

Acer dasycarpum Ehrhart

Preferring sandy river-banks, the Silver maple, or Soft maple as it is often called, ranges from New Brunswick to southern Ontario and South Dakota, southward to Florida, Missouri, and the Indian Territory, attaining a maximum height of about 40 meters and a trunk diameter of about 1.4 meters. It is also known as River maple, Water maple, White maple and Creek maple.

The brown bark of old trunks splits freely into thin scales, that of the limbs and young trunks is smooth and gray; the young twigs are green and smooth, but early become brown. The leaf-stalks are long and slender, the leaf-blades nearly orbicular in outline, bright green on the upper side, nearly white and often silvery beneath, hairy on the under side when young, but both surfaces smooth at maturity; they are 5-lobed to beyond the middle, the lobes pointed, coarsely and sharply toothed, or again lobed. The flowers appear in earliest spring in dense clusters much ahead of the leaves, the sterile and fertile ones in separate clusters, sometimes both on the same tree, sometimes on different trees; they are greenish yellow or reddish; there are no petals; the calyx has 5 short teeth and in the sterile flowers is nearly tubular with the stamens projecting far beyond it, but in the fertile flowers it is cup-shaped and not longer than the stamens, the ovary being densely hairy. The young samaras are hairy, but soon become smooth and more or less divergent; when ripe they are 5 to 7 cm. long with a wing 1.8 mm. wide or less.



FIG. 595. — Silver Maple.

The Silver maple is one of the most rapid-growing trees, and is used in large quantities for street planting, the brittleness of its wood being its only drawback for this purpose; violent summer gales will sometimes strew the ground with its branches. A number of varieties have been propagated and extensively planted for ornamental purposes.

The wood is hard, brittle, light brown, with a specific gravity of 0.53, and is used for furniture and to a limited extent in carpentry. A small amount of maple sugar is locally made from the sap.

9. RED MAPLE — *Acer rubrum* Linnaeus

The Red maple, one of the most beautiful of American trees, grows naturally all over the eastern United States and Canada from Nova Scotia to Georgia, and perhaps to northern Florida, westward to Manitoba, Wisconsin, Missouri, and Texas. It prefers wet soil, and often forms forests or groves in swampy lands, but often occurs on hillsides. It attains a maximum height of about 40 meters and a trunk diameter of about 1.5 meters.



FIG. 596. — Red Maple, New York Botanical Garden.

The bark is not very thick, that of young trunks being smooth and gray, that of old trees darker in color, shaggy, separating in long plates or scales. The young twigs are smooth and green, soon becoming red. The leaves are 1.5 dm. long or less, long-stalked, broadly ovate or nearly orbicular in outline, rather thin, usually 5-lobed, often 3-lobed, mostly rounded or subcordate at the base, at first more or less hairy on the under side, but when mature usually nearly or quite smooth on both surfaces, light green above, and pale green or whitish beneath; the lobes are

coarsely toothed. The red, scarlet or rarely yellow flowers appear in dense clusters before the leaves at the axils of leaves of the preceding season, some of the clusters composed of staminate and some of pistillate flowers, either on the same or on different trees; the flowers are stalked, and the stalks of the pistillate ones greatly elongate as the fruit matures; the sepals are oblong, blunt, wavy-margined or nearly entire, and about as long as the similar narrower petals; the staminate flowers have from 3 to 8 stamens with filaments two or three times as long as the sepals; the pistillate flowers have a smooth ovary and 2 long styles, which are united at the base, and stamens shorter than the sepals. The red or scarlet samaras vary from 2 to 3.5 cm. long and from 6 to 10 mm. wide, the wing broadest at or above the middle, the seed-bearing part slightly striate and about 6 mm. long.

The tree is of rapid growth, and is a great favorite for road and park planting, but is not usually adapted to city streets; it is little attacked by either insects or fungi. The foliage turns red or scarlet in late autumn and contributes much to the autumn coloration of the forest of eastern North America. The wood is light brown or reddish brown, not strong, with a specific gravity of about 0.62, and is largely used for furniture and wooden-ware. Among local common names for this tree are Swamp maple, Shoe-peg maple, Soft maple, Scarlet maple, Water maple, and White maple.



FIG. 597. — Red Maple.

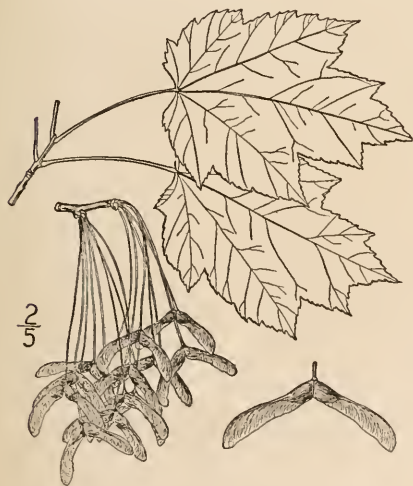


FIG. 598. — Narrow Fruited Maple.

10. NARROW FRUITED MAPLE

Acer stenocarpum Britton, new species

This name is given to small trees growing in flinty soil at Allenton, St. Louis county, Missouri, from which specimens were collected by Mr. G. W. Letterman in 1884, inasmuch as the fruit seems to be quite different from that of any forms of the Red maple.

The leaves are similar to those of the Red maple, thin, 3-lobed or 5-lobed, light green above and pale beneath. The red flowers appear before the leaves. The samara are borne on exceeding slender stalks, 5 to 7 cm. long; they are almost linear, not widened above, about 2 cm. long,

and 3 to 5 mm. wide, slightly curved, the seed-bearing part about 5 mm. long and very strongly striate.

11. CAROLINA MAPLE — *Acer carolinianum* Walter

Acer microphyllum Pax. *Acer tomentosum* Pax

While closely related to the Red maple, this tree of the southern United States differs from it so markedly as to warrant its recognition as a species. In New Jersey, where both forms occur, there is no difficulty in telling them apart at a glance when in foliage. The most northern point at which we have observed the Carolina maple is near Stroudsburg, in eastern Pennsylvania, but it is reported from Massachusetts; it is plenty in south-central New Jersey and thence south to Florida, extending west to Texas and to southern Missouri.



FIG. 599. — Carolina Maple.

The bark of the trunk is light gray and relatively smooth. The leaves are dark green on the upper surface, white-glaucous, and more or less hairy on the under side, at least along the veins, thicker than those of the Red maple, usually 3-lobed and obovate in outline and narrowed or wedge-shaped at the base, but sometimes 5-lobed and nearly orbicular, varying greatly on the same tree; they are rarely ovate and without lobes; the margin is toothed. The fruit closely resembles that of the Red maple, is bright red or sometimes yellow, and is nearly fully grown before the leaves unfold.

This tree was described by Professor Alphonso Wood as *Acer rubrum* variety *tridens*, in allusion to its prevailing 3-lobed leaves.

12. DRUMMOND'S MAPLE — *Acer Drummondii* Hooker and Arnott

A tall swamp tree, with scaly bark, occurring from Missouri to Texas and eastward to Georgia and Florida, attaining a height of at least 30 meters. It is related to the Red maple of the North, and has been regarded by some authors as a form of that tree.

The young twigs are white-woolly, but soon become smooth. The long-stalked leaves are woolly on both sides at the time of unfolding but soon become smooth and dark green on the upper side, but remain woolly, often densely so, on the lower surface, at least along the veins, until they fall away in the autumn; they are

3-lobed, or sometimes 5-lobed, usually cordate or truncate at the base, very light green or nearly white beneath, often 12 cm. across; the pointed lobes are very coarsely toothed or again lobed. The flowers are dioecious, so far as they are known, and appear before the leaves very early in the season. The samaras are larger than those of the Red maple, being 3.5 to 6.2 cm. long, nearly erect or somewhat divergent, with a wing 1 to 2 cm. in width.

The persistently woolly leaves and large fruit seem to mark this southern tree as specifically different from the northern Red maple.

The wood of Drummond's maple is very similar to that of the Red maple.



FIG. 600. — Drummond's Maple.

13. SUGAR MAPLE — *Acer Saccharum* Marshall

Acer saccharinum Wangenheim, not Linnæus

The Sugar maple prefers rocky uplands, and is often called Rock maple, Sugar tree, and Hard maple; it is a grand tree, sometimes attaining a height of 40 meters, with a trunk diameter of 1.5 meters, perfect specimens appearing when in leaf, like great round domes. It ranges from Newfoundland to Georgia, but south of Maryland is rare near the coast, and extends westward to Manitoba, Nebraska, and Texas.



FIG. 601. — Sugar Maple.

The bark of old trunks is channelled, brown and scaly, that of young ones light brown and smooth. The young twigs are smooth and green, but soon become brown or orange-brown; the inner bud-scales are silky, becoming 2 to 4 cm. long in unfolding, and light yellow. The long-stalked spreading leaves are rather thin in texture, dark green above, paler green or quite glaucous beneath, hairy on the under side when young, but nearly or quite smooth when mature; they are orbicular in outline or wider than long, 5-lobed or 3-lobed, 8 to 15 cm. broad, and more or less cordate at the base; the pointed lobes vary from coarsely toothed to entire-margined. The

the pointed lobes vary from coarsely toothed to entire-margined. The

yellow flowers appear with the leaves, or a few days before them, in clusters at and near the ends of twigs of the preceding season; they are long-stalked and drooping, the tree being conspicuous when in bloom; the staminate and pistillate flowers are in separate clusters; the pedicels and 5-lobed calyx are provided with long hairs; there are no petals; the staminate flowers have about 7 stamens twice as long as the calyx; in the pistillate flowers the stamens are only about as long as the calyx and the ovary is slightly hairy. The samaras vary from 3 to 4 cm. in length, the seed-bearing part about 1 cm. long and strongly reticulated, the parallel or slightly divergent wings 1.3 cm. wide or less.

This tree and the closely related Black maple are the principal sources of maple sugar. The wood has a specific gravity of about 0.70, is light reddish brown, and more valuable than that of any other maple, being used in large amounts for furniture, flooring, decorative work, tool-handles, shoe-pegs, and in ship-building; birdseye and curled maple, so much prized for cabinet work, are this wood with an irregular or twisted grain. The tree is of rather slow growth, but otherwise very desirable for road and park planting. Its foliage turns from yellow to orange or scarlet in the early autumn and is a striking feature of the forests at that time of year.

Rugel's maple (*Acer Rugelii* Pax) is a form of the Sugar maple with small leaves, the lobes of which are usually without teeth; it occurs from Georgia and North Carolina through Tennessee to Missouri, and locally further north; it does not seem to be a distinct species.

The Norway Maple, *Acer platanoides* Linnæus, a tree of northern Europe, much planted as a favorite shade tree and attaining a height of 30 meters is occasionally spontaneous about cities and towns. Its usually 5-lobed leaves are sharp or taper-pointed and coarsely sharp-toothed, deeply heart-shaped at the base, 9 to 15 cm. broad, dull green and smooth above, light green, smooth and prominently thin veined beneath, these exuding a milky juice on being punctured. The flowers which appear in June are yellowish green, in pendulous corymbs, the broad wings of the fruit spreading at right angles. The foliage turns a bright yellow in autumn.



FIG. 602. — Black Maple.

14. BLACK MAPLE — *Acer nigrum*

F. A. Michaux

This tree has often been regarded as a variety of the Sugar maple, but recent studies by many botanists indicate that it is specifically distinct. Like its relative, it is an upland species, and is known to grow naturally from Quebec to Georgia, South Dakota, Kansas, and Louisiana; within this area it locally entirely replaces the Sugar maple, while in other localities it is not known to exist, its distribution being peculiar in this re-

spect. While commonly smaller, it sometimes attains as great a size as the Sugar maple, and is also known as Black sugar maple.

The old bark is dark brown or nearly black, fissured and scaly. The young twigs are usually hairy, yellowish green, becoming orange-brown and smooth. The leaves are often wider than long, sometimes 2 dm. broad, cordate at the base, with the basal lobes often overlapping, dull darkish green above and nearly of the same hue beneath, 3-lobed or 5-lobed, with the lobes entire or wavy-margined, rarely with one or two large teeth; they are quite densely hairy beneath when young, and somewhat hairy, at least on the veins, when mature; the leaf-stalks are also hairy, at least when young, and are expanded at the base, often bearing stipules which are sometimes 3 or 4 cm. long. The flowers are borne on drooping, hairy pedicels, and closely resemble those of the Sugar maple. The samaras are nearly the same as those of the Sugar maple, but the wings are usually more divergent.

The Black maple is a very attractive shade tree, but is not as much planted as the Sugar maple. Its wood is very similar to that of the Sugar maple.

15. FLORIDA SUGAR MAPLE — *Acer floridanum* (Chapman) Pax

Acer saccharinum floridanum Chapman

This southern relative of the Sugar maple is a graceful tree, rarely more than 18 meters high, with a maximum trunk diameter of about 1 meter. The bark is chalky white, that of old trunks rough, that of young trees smooth or nearly so. The tree grows naturally in river swamps from Georgia and Florida to Louisiana, and is reported to exist further west in Texas and northern Mexico.

The young twigs are smooth and green, soon turning brown. The slender-stalked leaves are orbicular in outline, or often wider than long, 5 to 9 cm. broad, deep green above, glaucous and smooth or somewhat hairy on the veins beneath, truncate at base, or but slightly cordate, 3-lobed or 5-lobed, with



FIG. 603. — Florida Sugar Maple.

short, blunt or pointed, entire or wavy-margined lobes. The flowers resemble those of the Sugar maple, but are smaller and shorter stalked, appearing with the leaves, the drooping pedicels and the 5-lobed calyx hairy. The samaras are green, 1.5 to 3 cm. long, the more or less divergent wings 8 mm. wide or less.

This interesting tree differs from the others of the Sugar maple group in growing in wet soil, they being upland species.

16. WHITE-BARKED SUGAR MAPLE — *Acer leucoderme* Small

This, the smallest of the eastern Sugar maples, inhabits rocky river-banks and ravines from North Carolina and Georgia westward to Arkansas and Louisiana. It is not known to become more than 13 meters high, nor to form a trunk more than 0.5 meters in thickness, and is often a mere shrub.

The bark of old trunks is smooth and white, or brown and ridged at the base



FIG. 604. — White-barked Sugar Maple.

of the tree; that of the branches is gray or reddish. The young twigs are smooth and green, but soon become red-brown and shining. The leaves are usually broader than long, but sometimes nearly orbicular in outline, 5 to 10 cm. across, 3-lobed to 5-lobed, dark green and smooth above, lighter green and hairy beneath, even when old, truncate to cordate at the base, the pointed lobes with one or more large teeth, or wavy-margined. The flowers resemble those of the Florida sugar maple, being smaller than those of the Sugar maple of the North, and appear with the leaves on filiform smooth drooping pedicels; the ca-

lyx is undulately 5-lobed; the ovary and young fruit are hairy, the ripe samaras are red, 1 to 2 cm. long, smooth, the parallel or divergent wings 5 to 8 mm. wide.

The tree has been planted for shade in some southern cities; it is probably not hardy north of Virginia.

17. MOUNTAIN SUGAR MAPLE — *Acer grandidentatum* Nuttall

A species of the Rocky mountain region, this tree ranges from northern Montana to eastern Utah, Wyoming, western Texas, and New Mexico, extending southward into Mexico. It sometimes reaches a height of 13 meters, with a trunk 2.5 dm. in diameter. It prefers the sides of cañons and banks of streams.

The bark of old trunks is dark brown and scaly, that of young trees lighter brown. The smooth green young twigs soon turn brown. The rather stout-petioled leaves are usually wider than long, 5 to 9 cm. wide, 3-lobed with coarsely

toothed lobes, short-pointed, cordate at the base, the upper surface bright green and smooth, the lower somewhat paler green and finely hairy, even when old. Like the other Sugar maples the flowers are in clusters at and near the ends of the twigs, and appear with the leaves or a little before them. The drooping pedicels and the 5-lobed calyx are hairy; the stamens of the staminate flowers are relatively shorter than those of the eastern trees, being about one and one-half times

as long as the calyx. The samaras vary from 2 to 4 cm. long, the broad wings 1.5 cm. wider or less, either nearly parallel or quite widely divergent.

The wood is hard, close-grained, light brown to nearly white; its specific gravity is about 0.69.

Local names are Large-toothed maple, Hard maple, and Western sugar maple.



FIG. 605. — Mountain Sugar Maple.

18. ASH-LEAVED MAPLE — *Acer Negundo* Linnæus

Negundo aceroides Mœnch

The Ash-leaved maple, often called Box elder, ranges naturally from western Vermont to western New Jersey and northern Florida, westward to Ontario, Manitoba, South Dakota, Kansas, Texas, and Mexico. It is not native along the Atlantic coast, but is widely planted for ornament. The tree attains a maximum height of about 23 meters and a trunk diameter of 1.5 meters. It prefers the banks of streams and lakes, or the edges of marshes.



FIG. 606. — Ash-leaved Maple.

The bark of old trees is quite thick, ridged, scaly and light brown, that of young trees is smooth and gray. The young twigs are green, and either smooth or finely velvety; they become purplish and covered with a bloom. The leaves are pinnately compound, usually with 3 leaflets, but there are sometimes 5 leaflets; the end leaflet is long-stalked, the lateral ones short-stalked; in shape the leaflets vary from ovate to oval, ovate-lanceolate or obovate; they are thin, entire-margined or coarsely toothed, rarely 3-lobed, some-

what hairy on both sides when young, smooth above or minutely papillose when old, more or less hairy on the under side when mature, bright green on both sur-

faces or a little paler beneath than above, and vary from 5 to 13 cm. in length. The clustered flowers are without petals and borne on the twigs of the past season, at the scars of last year's leaves, and appear with the new leaves or a little before them, the staminate and pistillate flowers on different trees; the staminate ones are on hairy drooping pedicels, have a 5-lobed calyx and about 5 stamens with long-pointed anthers much projecting beyond it; the pistillate flowers are in smooth or hairy drooping racemes, which greatly elongate as the fruit matures, have 5 linear-oblong sepals, a slightly hairy ovary, 2 slender styles and no stamens. The samaras are smooth or a little hairy, divergent at various angles, 2 to 4 cm. long, the wings 1 cm. wide or less, the oblong ridged seed-bearing part 1 to 1.5 cm. long, the united portion constricted near the base, a feature which distinguishes this eastern tree from the western species of Ash-leaved maples.

The wood is white, soft and weak, with a specific gravity of about 0.43, and is used to some extent for furniture, woodenware, and in carpentry; some maple sugar is locally made from the sap. The tree is of rapid growth, and very extensively used in planting along roads and in parks. A very large number of garden forms have been developed from seeds in European nurseries. Among common names for the tree are Three-leaved maple, Black ash, and Sugar ash. A Texan form is more hairy and has been described as a distinct species (*Acer texanum* Pax).

The Ash-leaved maples differ from the typical maples in their compound leaves, and are often regarded as forming a separate genus (*Rulac* Adanson; *Negundo* Moench).



FIG. 607. — California Ash-leaved Maple.

19. CALIFORNIA ASH-LEAVED MAPLE

Acer californicum (Torrey and Gray)
Dietrich

Negundo californicum Torrey and Gray

The California Ash-leaved maple has been regarded by some authors as a variety of the eastern tree, but it seems to us better to consider it as a distinct species. It is, so far as known, restricted to California, occurring along streams and in cañons. It sometimes attains a height of 16 me-

ters and a trunk diameter of nearly 1 meter.

The young twigs are finely velvety, green, turning gray. The leaves usually have 3 leaflets, though there are sometimes 5; these are ovate or ovate-lanceolate

in outline, or the terminal one nearly round in outline, pointed, very coarsely toothed or sometimes 3-lobed, densely hairy on the under side even when nearly or quite mature, and more or less hairy on the upper surface. The flowers appear with the leaves, and resemble those of *Acer Negundo*, but the pedicels, calyx, ovary, and styles are densely woolly. The samaras are about 3 cm. long, little divergent, finely hairy even when ripe, the united part not constricted at the base, the usually incurved wings 1 cm. wide or less, often overlapping, adnate to the seed-bearing part only to or above the middle.

The wood is nearly white, and a little heavier than that of the eastern tree; its specific gravity being about 0.48. The tree is planted for shade in California, and is locally known as False maple and Box elder maple.

20. WESTERN ASH-LEAVED MAPLE — *Acer interior* Britton, new species

The Ash-leaved maple which inhabits the central part of the United States, ranging from Alberta and Montana to Wyoming, western Nebraska, Kansas, Colorado, New Mexico, and Arizona, differs both from the eastern species and from that of California in features which while individually seem insignificant are collectively sufficient to warrant its recognition as a species. It is also known as Water ash.

Its young twigs are either smooth or finely velvety, and covered with a bloom. The leaflets are firm in texture, thicker than those of *Acer Negundo*, somewhat hairy on the under side, at least along the veins, and usually have some hairs on the veins upon the upper surface; they are coarsely toothed, or often lobed, and usually 3 in number, rarely 5. The anthers are not long-pointed. The samaras are more or less divergent, smooth when mature and 3 or 4 cm. long, the outer edge of the wing straight or somewhat curved, the wing adnate to the seed-bearing part to about the middle, the united portions not constricted at the base when ripe, though sometimes slightly so when the fruit is young.

This tree ranges further north than the eastern species, and is more hardy in cultivation. It is sometimes planted in the East, and extensively as a shade tree within its range. The type specimen of the species is one collected by Professors Underwood and Selby on chapparal covered hills southeast of Ouray, Colorado, Sept. 7, 1901 (No. 11).



FIG. 608. — Western Ash-leaved Maple.

21. KING'S ASH-LEAVED MAPLE — *Acer Kingii* Britton, new species

This tree inhabits the Wahsatch Mountains of Utah. It is apparently nearest related to the next preceding species, having similar foliage, and the united part of the samaras is not constricted at the base, but the samara-wings are adnate to the seed-bearing parts down to the point at which these are united.



FIG. 609. — King's Ash-leaved Maple.

The only specimens known to us were collected in the Wahsatch Mountains at about 2000 meters altitude, by Dr. Sereno Watson, during Mr. Clarence King's Geological Exploration of the Fortieth Parallel, August, 1869 (No. 216); here the trees are stated to be abundant. The specimens have finely velvety twigs, the leaves with 3 leaflets, which are pointed and coarsely toothed, and very long racemes. The long filiform pedicels of the fruit are somewhat hairy and the samaras are about 3.5 cm. long, little divergent, the wings curved on the back and 1 cm. wide or less.

THE BUCKEYE FAMILY

ÆSCULACEÆ Lindley



HIS family consists of 2 genera with about 16 species of trees or shrubs of the northern hemisphere. They are of little economic value, but are great favorites as shade trees and of some importance for timber.

The *Æsculaceæ* have opposite, stalked, digitately compound leaves, consisting of 3 to 9 leaflets, without stipules. The flowers are borne in conspicuous terminal panicles; they are polygamous, unsymmetrical and irregular. Their calyx is 5-lobed, the lobes unequal; the corolla is of 4 or 5 elongated, unequal petals consisting of a blade and a claw; the disk is annular or one-sided, with 5 to 8 stamens inserted upon it, their filaments distinct, very long; anthers introrse; the ovary is sessile, 3-celled; styles elongated and united, the stigma entire; ovules 2 in each cell. The fruit is a leathery, dehiscent, smooth or spiny capsule; seeds large, usually but one or two, with a thick, tough testa and large, thick cotyledons; there is no endosperm. In addition to the genus *Æsculus* there is a Mexican genus, *Billia*, with one species.

THE BUCKEYES

GENUS *ÆSCULUS* LINNÆUS



ÆSCULUS, an ancient name of some other tree, was applied to the Horse-chestnuts and Buckeyes by Linnæus, and has been their generic name since his time. The genus includes both trees and shrubs distributed in temperate regions of Europe, Asia, and America, extending in the New World as far south as Venezuela. There are about four Asiatic species known; the Horsechestnut, the type of the genus, is a native of southeastern Europe, while in America there are about 10 species, one of them in northern South America, two in Mexico, 7 within the limits of the United States, of which 5 are trees, while *Æ. parviflora* Walter, of the southeastern States, and *Æ. arguta* Buckley, of the plains from Missouri to Texas, are known only as shrubs.

The bark of these plants is unpleasantly odorous, the twigs round, the leaf scars triangular, the buds large and in some species very resinous. The showy flowers are borne in large clusters at the ends of branches, many of them imperfect and sterile; they appear after the leaves are nearly or quite fully grown; the tubular to bell-shaped calyx is unequally 5-lobed; there are 4 or 5 unequal clawed petals, when 4 they are in 2 pairs; the filaments are filiform. The capsule has 3

leathery valves which split when it is ripe to release the one to three large shining seeds.

Capsule spiny, at least when young; stamens exserted.

Flowers white, mottled with yellow and purple; petals 5; introduced European tree.

Flowers yellow or greenish yellow; petals 4; native tree.

Capsule smooth; petals 4; native trees.

Stamens much exserted; winter-buds resinous; California tree.

Stamens included or but little exserted; winter-buds not resinous; eastern and southern trees.

Calyx tubular, red or reddish.

Leaflets densely tomentose beneath; seeds yellow-brown.

Leaflets glabrate beneath; seeds dark brown.

Calyx oblong-campanulate, greenish.

1. *Æ. Hippocastanum*.

2. *Æ. glabra*.

3. *Æ. californica*.

4. *Æ. austrina*.

5. *Æ. Pavia*.

6. *Æ. octandra*.

1. HORSECHESTNUT — *Æsculus Hippocastanum* Linnæus

The Horsechestnut, a native of Asia, has long been cultivated for shade and ornament in Europe and America, and it has escaped from cultivation locally in the eastern United States. It is a very large tree with spreading branches, sometimes attaining a height of about 30 meters, with a trunk 2 meters in diameter.



FIG. 610. — Horsechestnut.

The bark of the old trees is 1 cm. thick or more, shallowly fissured into small irregular scaly dull brown plates. The young twigs are smooth, round, reddish brown, with large leaf scars, the large pointed buds very resinous-sticky. The long-stalked leaves are hairy when young, but smooth or nearly so when old; there are 5 or 7 leaflets, dark green on the upper surface, paler green beneath; they are obovate or oblanceolate, 1 to 2 dm. long, abruptly pointed, irregularly finely toothed, wedge-shaped at the base. The flowers are in large clusters often 3 dm. long, at the ends

of branches, and open in June or July; the axis of the cluster, the flower-stalks and calyx are finely hairy; the calyx is bell-shaped and 5-lobed; the petals are white, blotched with red and yellow, unequal in size and shape; the stamens are longer than the petals and curved upward. The globular fruit is covered with prickles and contains several shining brown seeds.

The tree is called Chestnut in England, as distinguished from the Sweet chestnut (*Castanea*), and is also known as Bongay. It is much used as a street tree in European cities.

2. OHIO BUCKEYE — *Æsculus glabra* Willdenow

This tree grows best in moist soil, especially along and near rivers, and is distributed from western Pennsylvania to Alabama, Illinois, Iowa, and the Indian Territory. It is known also as Fetid buckeye and Stinking buckeye, from its unpleasant odor, and as American Horse-chestnut. It attains a maximum height of about 25 meters, with a trunk diameter of 6 dm., but is usually smaller, commonly not over 15 meters in height.

The thick bark is gray, channelled, breaking up into plates. The young twigs are brown and finely hairy, becoming smooth and reddish brown. The terminal buds are about 2 cm. long, pointed, their scales keeled, nearly triangular, the outer ones covered with a thin bloom. The leaves have 5 or 7 oblong to obovate thin leaflets, which are quite hairy when young, but only slightly hairy on the pale green under side when old, 7 to 18 cm. long, sharply and irregularly toothed with small teeth, sharply rather long-pointed, narrowed at the base and short-stalked; the

rather stout leaf-stalks are 15 cm. long or less, finely hairy when young, but become smooth or nearly so. The tree flowers in April or May, having numerous yellow or greenish flowers in dense finely hairy panicles; the flower-stalks are about 5 mm. long; the calyx is bell-shaped, 6 to 8 mm. long, finely hairy, the short lobes blunt; the petals are 12 to 18 mm. long, crisped, loosely hairy, the limb longer than the claw, that of the upper pair spatulate, narrower than that of the lateral ones; the usually 7 stamens are considerably longer than the petals, their anthers orange; the ovary is rough-prickly. The fruit is round or somewhat pear-shaped, 7 cm. in diameter or less, prickly, borne on stout stalks; the seeds are somewhat flattened, 2 to 4 cm. broad.

The wood is weak and soft, whitish, with a specific gravity of about 0.45, and is used for paper-pulp, woodenware, in construction, and for artificial limbs.



FIG. 611. — Ohio Buckeye.

3. CALIFORNIA BUCKEYE — *Æsculus californica* (Spach) Nuttall

Calothyrsus californica Spach

The California buckeye is a low and very beautiful tree, which grows in river valleys only in California. It attains a maximum height of 12 to 15 meters, with a short trunk often a meter in diameter or more, but it is usually much smaller, and commonly only a tall shrub.

The light gray bark is smooth or nearly so. The young twigs are gray-brown or somewhat reddish, smooth and round. The buds are very sticky, dark brown and pointed. The leaves usually have either 5 or 7 leaflets, rarely only 4; the leaf-stalks are grooved and from 4 to 12 cm. long; the leaflets are lanceolate or oblong-lanceolate, 5 to 15 cm. long, somewhat hairy when young, pointed, smooth or nearly so when old, very finely toothed, dark green on the upper surface, pale green and with the veins rather conspicuous on the under side, the base usually unequal-sided and varying from narrowed to somewhat heart-shaped. The dense flower-clusters are long-stalked, 1 to 2 dm. long, about 6 cm. thick, their branches, the short flower-stalks and the calyx finely and densely hairy; the flowers open from May to July; the calyx is narrowly bell-shaped, 6 to 8 mm. long, its lobes sometimes toothed; the petals are white or pale pink, about 2 cm. long, oblong and bluntish; the 5 or 7 stamens are nearly twice as long as the petals, their filaments very narrow, the short anthers orange; the ovary is very hairy. The fruit is smooth, nearly pear-shaped, short-stalked, usually oblique, 8 cm. long or less, its valves thin; it generally contains but one seed.

FIG. 612. — California Buckeye.

The wood is nearly white, dense but soft; its specific gravity is about 0.50. The tree has been considerably planted in California for ornament, as well as in Europe; its leaves fall early in the season, often soon after the time of flowering. The seeds are roasted by the Indians, soaked in water, which removes the poisonous principle contained in them when fresh, and are then used as food.

4. SOUTHERN BUCKEYE

Æsculus austrina Small

This small tree or shrub has been confused with both the Sweet buckeye and the Red buckeye. It grows in rich soil, along rivers or in woods, from Tennessee and Missouri to Louisiana and Texas, and perhaps occurs further east. It is not known to attain a height of more than 10 meters, nor a trunk diameter of over 1.5 dm., and often flowers as a shrub.

The bark is light brown and smooth, or nearly so. The young twigs are finely



FIG. 613. — Southern Buckeye.

hairy, becoming smooth and gray, the buds smooth, not sticky, blunt, the terminal ones 6 mm. long or more. The leaves are usually composed of five leaflets; the leaf-stalk is stout, finely hairy, 7 to 15 cm. long; the leaflets are usually short-stalked, oblong-lanceolate to oblanceolate, pointed, 6 to 15 cm. long, finely and somewhat irregularly toothed, and when mature are bright green and shining on the upper side, but pale and densely velvety-hairy on the under surface; the lower ones are sometimes very unequal-sided at the base. The flowers open in April or May, the clusters 1 dm. long or longer, the flower-stalks densely and finely hairy; the calyx is finely hairy or nearly smooth, tubular or tubular-bell-shaped, 10 to 15 mm. long, its lobes short and blunt; the petals are very unequal, red, similar to those of the Red buckeye; the stamens are about as long as the narrower pair of petals and have hairy filaments; the ovary is hairy. The fruit is pear-shaped or nearly globular, 6 cm. long or less, smooth, its valves thin; the seeds are yellow-brown, 2 to 3.5 cm. broad.

5. RED BUCKEYE — *Æsculus Pavia* Linnæus

While usually a shrub not over 4 meters high, the Red buckeye occasionally forms a small tree 6 meters tall. It grows in rich soil, in woods and along streams, from Virginia to Florida, westward to Missouri, Arkansas, and Texas, flowering in March, April, or May.

The bark is smooth and brown. The young twigs are finely hairy or smooth, round, gray to brown, the buds not resinous. The leaves have 5 or 7 stalked leaflets; the slender leaf-stalk is 15 cm. long or less; the leaflets are oblong, oblanceolate or obovate, rather thin, very finely and closely toothed, 5 to 15 cm. long, pointed, dark green, smooth and shining on the upper surface when mature, paler green and smooth or slightly hairy on the under side, the base narrowed. The flower-clusters are 1 to 2 dm. long, the axis, flower-stalks, and calyx finely hairy; the tubular calyx is reddish, about 1.5 cm. long, its lobes short and blunt; the petals are red, 2.5 to 4 cm. long, their claws hairy, the upper pair with claws as long as the oblong blades, the lateral pair with longer claws and nearly orbicular blades; the stamens are as long as the petals or a little longer, the lower parts of the filaments hairy. The fruit is smooth.



FIG. 614. — Red Buckeye.

6. SWEET BUCKEYE — *Æsculus octandra* Marshall*Æsculus flava* Aiton

This tree, known also as Yellow buckeye and Big buckeye, is the largest American species of the genus, occasionally attaining a height of 35 meters, with a trunk a meter in diameter; it is usually smaller, however, commonly not exceeding 20 meters in height, and is reported to flower as a shrub in western Texas. It grows in rich soil, preferring valleys, and ranges from western Pennsylvania to Illinois, Iowa, and the Indian Territory, south to Georgia, Louisiana and Texas, blooming, according to locality, from March to June.



FIG. 615. — Sweet Buckeye.

The thick bark is brown, fissured and scaly. The young shoots are finely hairy, becoming smooth and brown, the buds bluntish, not resinous, the terminal ones 2 to 2.5 cm. long, their ovate scales covered with a thin bluish bloom. The leaves are more or less hairy when young; they have 5 or 7 short-stalked or stalkless leaflets, the slender leaf-stalk 1 to 1.5 dm. long, finely hairy or smooth; the leaflets vary from oval or elliptic to obovate, and from 1 to 2.5 dm. long; they are finely toothed, long-pointed, narrowed at the base, with the lower pair oblique, dark green and smooth on the upper surface when mature, yellowish green and somewhat hairy on the under side, at least along the veins. The flower-clusters are 1 to 3 dm. long and finely hairy; the calyx is narrowly bell-shaped, 1 to 1.5 cm. long, its lobes blunt; the petals are yellow or purplish, 2 to 3 cm. long, those of the upper pair with oval blades nearly as long as the hairy claw, the lateral pair with shorter blades and much longer claws; the stamens are not longer than the petals, their filaments hairy. The fruit is obovoid, 4 to 6 cm. thick, smooth, its valves thin; there are several seeds, 2 to 3.5 cm. broad.

The wood is white and soft, with a specific gravity of about 0.43, and is used for artificial limbs, woodenware, and paper pulp. The tree grows rapidly and is desirable for lawn and park planting.

THE SOAPBERRY FAMILY

SAPINDACEÆ R. Brown



APINDACEÆ consist of about 120 genera, comprising some 1000 species of trees, shrubs or vines, a few of them herbaceous. They are of wide distribution, but especially numerous in the tropical regions of the Old World. They are of no great economic value, except that the saponin, which many of them contain, principally in their bark, renders them of value as a vegetable soap, and to some extent in medicine.

The *Sapindaceæ* have mostly alternate, compound leaves, generally pinnate and without stipules. The flowers are in racemose panicles or corymbs, regular or slightly irregular, diœcious, polygamous, polygamo-diœcious or rarely perfect. The calyx is cleft into 4 or 5 imbricated sepals; the corolla consists of 3 to 5 petals, or sometimes wanting; disk fleshy, entire or lobed; stamens 5 to 10, sometimes fewer or more, usually inserted on the disk, their filaments distinct or sometimes united at the base; ovary 2- to 4-lobed or entire, 3-celled or 2- to 4-celled, the styles partly united; stigma capitate or lobed, the ovules 1 or several in each cell. The fruit is various, being leathery or membranous, capsular or berry-like; seeds 1 or more in each cavity, bony, leathery or crustaceous, with thin fleshy endosperm or none.

In addition to the trees there are several genera of climbers in our area, the best known being the herbaceous Balloon vines, *Cardiospermum*, of which 3 species occur in the United States. Our arborescent genera are:

Fruit berry-like, sessile; flowers regular.

Ovules solitary in each cavity of the ovary.

Ovules 2 in each cavity.

Ovary 2-celled; leaflets 2, 4, or 6.

Ovary 3-celled; leaflets 3.

Fruit a leathery capsule, stalked.

Flowers regular; ovules 1 in each cavity.

Flowers irregular; ovules 2 in each cavity.

1. *Sapindus*.

2. *Exothea*.

3. *Hypelate*.

4. *Cupania*.

5. *Ungnadia*.

I. THE SOAPBERRIES

GENUS **SAPINDUS** [TOURNEFORT] LINNÆUS



THE name *Sapindus* is from the Latin *Sapo indicus*, Indian soap, in allusion to the saponifying properties of the berries, the pulp of which makes a lather when rubbed up in water. About 10 species are known; distributed in tropical and warm-temperate regions of America and Asia; *Sapindus Saponaria* Linnaeus is the type of the genus.

These trees have bitter bark, round or angled twigs, alternate pinnately compound leaves without stipules, entire-margined leaflets, and very small regular clustered diœcious or polygamous flowers, the clusters borne at the ends of branches. The calyx is composed of 4 or 5 sepals; there are 4 or 5 petals alternate with the sepals, in some species with 2 appendages at the base; the stamens vary from 4 to 10, those of the staminate flowers much longer than those of the pistillate ones; the filaments are very slender or filiform, often hairy, the anthers short; the ovary is from 2-celled to 4-celled, and 2-lobed to 4-lobed, with 1 ovule in each cavity; the style is short, the stigma with as many lobes as the ovary. The fruit is a smooth fleshy berry, with firm translucent pulp, containing a large seed, which has a tuft of hairs at its base.

The North American species may be distinguished as follows:

Leaflets obtuse or acutish, not acuminate; rachis winged.

1. *S. Saponaria*.

Leaflets acuminate; rachis wingless or merely margined.

2. *S. marginatus*.

Petals lanceolate; Florida tree.

3. *S. Drummondii*.

Petals ovate; western tree.

1. SUMAC-LEAVED SOAPBERRY—*Sapindus Saponaria* Linnæus

This small tree inhabits southern Florida, the West Indies, and northern South America. It attains a maximum height of about 15 meters, with a trunk about 5 dm. thick; the branches are upright, the leaves evergreen.



FIG. 616. — Sumac-leaved Soapberry.

The thick bark is light gray outside, falling off in large, thin scales and exposing the darker inner layers. The young twigs are at first angular and green, finely hairy, becoming round, light brown, and smooth. The leaves are short-stalked, 2 dm. long or less, hairy when young, and have from 2 to 4 pairs of stalkless leaflets with or without a terminal one; the leaf-stalk and

leaf-rachis are broadly winged, the leaves thus somewhat resembling those of some sumacs; the leaflets are firm in texture, oblong, elliptic or somewhat obovate, blunt or bluntish, 3 to 12 cm. long, narrowed at the base, bright green, smooth and shining on the upper side when mature, paler green, strongly netted veined

and somewhat hairy beneath. The flowers appear in early spring, the dense and upright finely hairy clusters 1 to 2 dm. long; the sepals are round, blunt, about 2 mm. broad, the petals broadly obovate, about 3 mm. long, and hairy-fringed; the stamens of staminate flowers are about as long as the petals, those of pistillate flowers shorter; the filaments are hairy; the ovary is ovoid. The ripe fruits are globular, 10 to 18 mm. in diameter, shining, the pulp orange-brown, the seed black, obovoid.

The wood is dense, light brown, heavy, its specific gravity being about 0.83. The tree is known also as False dogwood.

2. FLORIDA SOAPBERRY—*Sapindus marginatus* Willdenow

An inhabitant of moist sandy soil in Florida, this tree attains a maximum height of about 10 meters, with a trunk 3 dm. in diameter; its branches are nearly erect. It was first discovered in Georgia, but is not at present known to grow in that State; it has also been reported as occurring on the coast of South Carolina.

The bark is light brown, the young twigs finely hairy, becoming smooth and pale gray. The leaves are hairy when young, becoming smooth or nearly so, and have 7 to 13 leaflets; the leaf-rachis is not winged, but is sometimes narrowly margined; the leaflets are lanceolate or oblong-lanceolate, somewhat scythe-shaped, long-pointed, short-stalked, 5 to 15 cm. long, unequal-sided, bright green above, paler on the under side; the flower-clusters are hairy, 3 dm. long or less; the flowers are 4 or 5 mm. wide, opening



FIG. 617. — Florida Soapberry.

in May and June; the sepals are oval or nearly orbicular, blunt, the petals ovate or oval, hairy, with 2 basal appendages, and are longer than the sepals. The fruit is globular or oval, 1.5 to 2 cm. long, keeled on the back, the pulp light yellow or orange, the seed brown and obovoid.

3. DRUMMOND'S SOAPBERRY—*Sapindus Drummondii* Hooker and Arnott

Drummond's soapberry grows in river valleys and on hillsides, from southern Missouri to Louisiana, the Indian Territory, New Mexico and northern Mexico. It reaches a maximum height of about 16 meters, with a trunk 6 dm. thick, but is

usually much smaller. The tree is called Chinaberry in New Mexico, and elsewhere known as Wild China. Its leaves are deciduous.

The thick bark is fissured and flaky. The young twigs are densely velvety, pale green, becoming gray and smooth, the buds small and nearly round. The leaves are 4.5 dm. long or less, and have 7 to 19 leaflets; the leaf-rachis is hairy, somewhat ridged, not winged; the leaflets are markedly scythe-shaped, very short-stalked, 3.5 to 10 cm. long, unequal-sided, long-pointed, obliquely broadly to narrowly lanceolate, smooth and dull green on the upper surface when mature, yellow green and more or less hairy beneath, at least on the veins. The flower-clusters are 1 to 2 dm. long; the flowers, which open from May to July, are about 4 mm. broad, the ovate pointed or bluntish sepals shorter than the obovate petals; the stamens of staminate flowers are a little longer than the petals. The fruits are globular, 1 to 1.5 cm. in diameter, not keeled, the pulp yellow, drying black, the obovoid seed dark brown.



FIG. 618. — Drummond's Soapberry.

The wood is light brown, dense but readily split, with a specific gravity of about 0.80; it is used in basketry.

The species was formerly confused with the preceding one, and was illustrated as such in "Illustrated Flora of the northern States and Canada."

II. INKWOOD

GENUS *EXOTHEA* MACFADYEN

Exothea paniculata (Jussieu) Radlkofer

Melicocca paniculata Jussieu. *Exothea oblongifolia* Macfadyen



INKWOOD is probably a monotype, though a second species of the genus has been described from Mexican specimens; the affinities of this are uncertain, however. The tree inhabits Florida, the Bahamas, Cuba, Porto Rico, Santo Domingo, Jamaica, St. Vincent, and Guatemala, attaining a height of 15 to 20 meters, with a trunk sometimes 5 dm. in diameter. The generic name, given by Macfadyen, is Greek, signifying to expel, this tree having been removed by him from the genus with which it was first associated by Jussieu. In the Bahamas it is known as Butter-bough.

The bark is reddish brown, rather thin, scaly. The young twigs are smooth, brown, and somewhat angled. The evergreen leaves are alternate, equally pinnate, with 2, 4, or 6 leaflets, rarely with but 1 leaflet or with 3; the leaf-stalk is

short and there are no stipules; the leaflets are nearly or quite smooth, oblong, elliptic or oblong-obovate, pointed, blunt or notched, entire-margined, 5 to 13 cm. long, dark green and shining on the upper side, lighter green on the under; they are narrowed at the base and very short-stalked or stalkless. The small diœcious or polygamous flowers, which open in March or April, are in terminal and axillary stalked clusters; the flower-stalks and calyx are finely hairy; there are 5 ovate, very blunt persistent sepals about 3 mm. long, and 5 white ovate-oblong petals nearly of the same length; the stamens are 7 or 8 in number, those of the staminate flowers about as long as the petals, those of pistillate flowers much shorter; the ovary is 2-celled, hairy, stalkless, the style very short, the knob-like stigma turned to one side. The fruit is a globular berry with a juicy orange-colored pulp, turning purple, 10 to 13 mm. in diameter, the seed yellow-brown.



FIG. 619.— Inkwood.

The heavy hard wood is red-brown, with a specific gravity of about 0.95; it is used in boat-building, for dock-piles, and for tool-handles.

III. WHITE IRONWOOD

GENUS **HYPELATE** PATRICK BROWNE

Species **Hypelate trifoliata** Swartz



THIS, the only known species of *Hypelate*, is an evergreen tree, occurring on the Keys of southern Florida, in the Bahama islands, Porto Rico, Cuba, and Jamaica. It attains a maximum height of about 13 meters and a trunk diameter of about 5 dm.

The thin bark is smooth or nearly so. The young twigs are round, smooth, slender and greenish, becoming gray. The leaves are composed of 3 leaflets, borne on a narrowly margined stalk 1 to 5 cm. long; there are no stipules; the leaflets are firm in texture, obovate or spatulate, entire-margined, blunt, somewhat pointed or rarely notched, 2 to 4.5 cm. long, finely veined, bright green and shining on the upper surface, paler and dull on the under side, both sides smooth. The tree flowers in May or June, the very small monœcious or polygamous flowers borne in long-stalked loose terminal and axillary clusters; there are 5 ovate blunt sepals, which are slightly hairy and hairy-fringed, 5 nearly round white hairy-fringed petals about 2 mm. long and about as long as the sepals; the stamens



FIG. 620. — White Ironwood.

(*Ruscus*), which this tree little resembles, however.

IV. CUPANIA

GENUS **CUPANIA** [PLUMIER] LINNÆUS

Species ***Cupania glabra*** Swartz

ABOUT 35 species of *Cupania* are known, all trees and shrubs, natives of tropical America. They have unequally pinnate leaves, with toothed leaflets and no stipules; the flowers are very small, regular, polygamous or diœcious, and are borne in large axillary clusters; the fruit is a 3-lobed, 3-celled leathery capsule, usually containing 3 seeds; *Cupania americana* Linnaeus, a common tree of Haiti, Cuba, and Porto Rico, is the type of the genus.

Cupania glabra is known in the United States only from Pine Key, southern Florida, where it was collected many years ago by Blodgett, and has not since been observed there. It is common in Cuba and Jamaica and occurs also in

FIG. 621. — *Cupania*.

number about 8, and have filiform filaments, those of the staminate flowers about as long as the petals, those of pistillate flowers shorter; the ovary is 3-celled, somewhat 3-lobed, with 2 ovules in each cavity; the style is short and the knob-like stigma turned to one side. The fruits are ovoid, black, 5 to 7 mm. long, the flesh thin, the pit thick-shelled, containing one seed.

The wood is dark brown, hard, strong, and durable; its specific gravity is about 0.95, and is used for fence-posts and tool-handles. The name Hypelate was taken up for this tree by P. Browne in his work on the plants of Jamaica; it is the ancient Greek name for the Butcher's broom of Europe

Central America and northern South America. In Cuba it attains a height of 12 meters or more, with a trunk at least 3 dm. thick.

The young twigs are finely hairy, becoming smooth and brown. The leaflets vary in number from 5 to 15; they are oblong to oblanceolate, narrowed at the base, firm in texture, 6 to 15 cm. long, short-stalked, blunt, strongly pinnately veined, shallowly toothed, quite hairy when young, smooth, dark green and shining on the upper side when mature, dull green and more or less hairy on the under surface. The flower-clusters are finely hairy and as long as the leaves or longer; there are 5 sepals, 5 rounded petals about as long as the sepals, and about 8 stamens, those of the staminate flowers rather longer than the petals; the style is short and 3-cleft. The capsule is rather sharply 3-lobed, top-shaped, 11 to 14 mm. long, its stout, stalk-like base about 5 mm. long.

V. SPANISH BUCKEYE

GENUS **UNGNADIA** ENDLICHER

Species ***Ugnadia speciosa*** Endlicher



NGNADIA is a monotype, occurring in Texas, New Mexico, and northern Mexico. It sometimes forms a tree about 10 meters high, a trunk 2 dm. thick, but is usually smaller and often shrubby. It grows on hillsides, in cañons, and along streams, and is known also as Texan buckeye.

The thin light gray bark is fissured, the twigs round, slender, finely hairy,



FIG. 622. — Spanish Buckeye.

becoming smooth and light brown. The buds are small and nearly globular. The alternate leaves are pinnately compound, long-stalked, the leaflets usually 5,

sometimes 3 or 7, quite hairy when young, but becoming nearly or quite smooth when old, the lateral ones nearly or quite stalkless, the end one slender-stalked; they are lanceolate to ovate or elliptic, 5 to 12 cm. long, pointed, rather finely and irregularly toothed, rounded or somewhat heart-shaped at the base, dark green and shining on the upper side, paler beneath. The large deep pink flowers are in finely hairy clusters on the sides of twigs at the axils of leaves of the preceding season, and open at or just before the unfolding of the leaves in March or April; their stalks are 6 to 15 mm. long, and jointed near the middle; the calyx is finely hairy and 5-lobed very nearly to the base, the lobes oblong and bluntish; the corolla is about 2.5 cm. wide when expanded; the 4 or 5 crested obovate petals are clawed, the claw hairy; there are 7 to 10 unequal stamens about as long as the petals, their filaments filiform and smooth; the ovary is hairy, stalked, three-celled with 2 ovules in each cavity; the style is long and very slender, tipped with the very small stigma. The fruit is a long-stalked, 3-lobed, 3-celled leathery capsule about 5 cm. thick, splitting into 3 valves when ripe; the seeds are depressed-globose, black, shining, 1 to 1.5 cm. broad, usually 3 in each capsule.

The wood is red-brown, brittle but dense, with a specific gravity of about 0.63.

THE BUCKTHORN FAMILY

RHAMNACEÆ Dumortier



THIS family consists of about 46 genera including nearly 600 species of trees, shrubs or vines, with or without spines. They are of wide distribution in both temperate and tropical regions and are of considerable economic importance on account of the bitter and astringent principle contained in many, rendering them of much value in medicine and in the art of tanning. One of the most important and most generally used American drugs, Cascara Sagrada, is the bark of *Rhamnus Purshiana* de Candolle a small tree of the northwestern United States and adjacent British Columbia. *Rhamnus cathartica* Linnæus, of which the fruit under the name Buckthorn berries is used, and *Rhamnus Frangula* Linnæus, of which the bark is used, are two well-known European drugs; the fruits of various species of *Zizyphus*, known as Jujube berries, are edible.

The *Rhamnaceæ* have alternate, rarely opposite, prominently nerved, simple leaves, with small stipules which in some species fall away early. The flowers are small, regular, perfect or polygamous, sometimes diœcious, and variously clustered. The calyx is 4-lobed or 5-lobed, the lobes valvate; disk fleshy, lining or filling the calyx-tube; the corolla, when present, consists of 4 or 5 petals, inserted on the calyx and alternate with its lobes; stamens 4 or 5, inserted with and opposite the petals; filaments distinct; anthers versatile, 2-celled; ovary partly immersed in the disk, 2-celled or 3-celled; styles and stigmas more or less united; ovules solitary or rarely 2 in each cavity and erect. The fruit is capsular or drupe-like, rarely winged; seeds solitary in each cell, smooth or furrowed, their endosperm fleshy or sometimes none; cotyledons usually very broad.

There are a number of genera, represented by shrubs or climbers, in addition to the following ones, containing arborescent species, occurring in our area:

Fruit more or less fleshy.

Fruit pulpy, with a 3-celled stone.

Petals absent.

Sepals crested; leaves usually opposite.

Sepals not crested.

Leaves opposite, evergreen; branches not spiny.

Leaves alternate, deciduous; branches spiny.

Petals present.

Fruit dryish, with 2 or 3 nutlets.

Fruit dry and hard, separating into 3 parts.

Sepals inflated; petals with slender claws.

Sepals spreading; petals without claws.

1. *Krugiodendron*.

2. *Reynosia*.

3. *Condalia*.

4. *Karwinskia*.

5. *Rhamnus*.

6. *Ceanothus*.

7. *Colubrina*.

I. BLACK IRONWOOD

GENUS **KRUGIODENDRON** URBAN**Krugiodendron ferreum** (Vahl) Urban*Rhamnus ferreus* Vahl. *Rhamnidium ferreum* Sargent

MONOTYPIC small evergreen tree or shrub, which has been referred by various authors to 8 different genera; it grows in southern Florida, and is widely distributed in the West Indies, from the Bahamas to St. Vincent and Jamaica, though not yet found in Cuba; it is common in Porto Rico. It sometimes grows to a height of 10 meters, forming a trunk 4 or 5 dm. thick, but is usually smaller.

The thick bark is ridged and gray, the young twigs green and velvety, becoming smooth and gray. The leaves are ovate to broadly oval, blunt or sometimes notched, entire-margined, firm, bright green and shining on the upper surface, dull green beneath, 2 to 5 cm. long, the upper ones of the twigs mostly opposite and the lower alternate; the stipules are thin, pointed, and fall away soon after the new leaves unfold; the leaf-stalks are 3 to 6 mm. long. The small greenish yellow flowers, which open in April or May, are in little axillary clusters much shorter than



FIG. 623. — Black Ironwood.

the leaves; they are perfect, regular, and about 4 mm. broad; there are 4 to 6, usually 5, triangular-ovate pointed sepals slightly united at the base, each with a crest on its inner side; there are no petals; the stamens are as many as the sepals, alternate with them and a little shorter; the ovary is ovoid, smooth, 2-celled, each cavity containing 2 ovules; the style is short and thick, the stigma 2-lobed. The fruit is an ovoid or nearly round black drupe, 5 to 8 mm. long, containing 1 bony pit.

The wood is very heavy, sinking in water, its specific gravity being about 1.30; it is hard, dense, and orange-brown. The genus was named by Professor Urban in honor of Leopold Krug, his associate for many years in the study of the West Indian flora.

II. RED IRONWOOD

GENUS **REYNOSIA** GRISEBACH*Reynosia septentrionalis* Urban

THE generic name *Reynosia* is in honor of Alvaro Reynoso, a Cuban chemist and agriculturalist, who died in 1888. About 9 species are known, evergreen trees and shrubs of the West Indies and southern Florida. The Red ironwood is a small tree, known also as Darling plum, which reaches a maximum height of about 9 meters, with a trunk diameter of about 2 dm.; it grows in southern Florida and also on the Bahama islands, and has been confused with the Cuban *Reynosia latifolia* Grisebach; the Cuban *Reynosia retusa* Grisebach is the type of the genus.

The thin bark is reddish brown, splitting up into thin plates. The young twigs are sparingly and finely hairy, angular, becoming smooth and gray-brown. The leaves are short-stalked, opposite, leathery, oblong to oval or somewhat obovate, 2 to 4 cm. long, entire, smooth, and nearly equally dull green on both sides, notched or blunt at the apex, narrowed at the base, finely netted-veined, their margins revolute; the very small stipules fall away soon after the leaves unfold.

The perfect and regular yellowish green flowers are about 5 mm. broad, borne in small axillary umbels, and open in March or April; the flower-stalks are 4 or 5 mm. long; the 5 ovate pointed sepals are a little united at the base; there are no petals; the 5 stamens are alternate with the sepals; the ovary is ovoid, 2-celled or 3-celled, with 1 ovule in each cavity; the style is short and thick, the stigma 2-lobed or 3-lobed. The fruit is an ovoid dark purple drupe, about 1.5 cm. long, tipped with the base of the style, its flesh edible, the stone round and hard.

The wood is just about as heavy as water, its specific gravity being 1.07; it is dark brown, very hard and dense.



FIG. 624. — Red Ironwood.

III. PURPLE HAW

GENUS **CONDALIA** CAVANILLESSpecies ***Condalia obovata*** Hooker

CONDALIA, named by Cavanilles in honor of Antonio Condal, a Spanish scientist of the eighteenth century, includes about 10 species of thorny trees and shrubs, natives of the southwestern United States, Mexico, and southern South America, the typical species being *Condalia microphylla* Cavanilles, of Chili. They have small alternate leaves, small, perfect and

regular flowers without petals, borne solitary or in clusters in the leaf-axils; the fruit is a small drupe.

Condalia obovata, known also as Logwood and Bluewood, inhabits dry regions in Texas and northern Mexico. It attains a maximum height of about 10 meters, with a trunk up to 2 dm. thick, has upright branches and zigzag gray, finely hairy twigs tipped by thorns; it is often shrubby, however, forming chapparal thickets, not over 4 meters high.

The bark is thin, brown and ridged. The leaves are obovate or spatulate, 1 to 2.5 cm. long, wedge-shaped at the base, entire-margined, hairy when young, at least on the under side, pale green

and smooth above, usually blunt at the apex and abruptly tipped, sometimes notched. The very small green flowers are solitary or few together in the axils and very short-stalked; there are 5 ovate pointed sepals, 5 stamens alternate with them, and a 1-celled ovary containing 1 ovule; the style is short and thick, the stigma 3-lobed. The drupe is dark blue or nearly black, oblong, about 6 mm. long, the pit thick-walled, the flesh sweet.

The wood is heavier than water, its specific gravity being about 1.20; it is red, hard and dense, is used for fuel and is said to yield a blue dye.



FIG. 625. — Purple Haw.

IV. NORTHERN KARWINSKIA

GENUS **KARWINSKIA** ZUCCARINISpecies **Karwinskia glandulosa** Zuccarini

USUALLY a shrub, this relative of the Buckthorns, which inhabits dry soil from Texas to New Mexico, Lower California, and northern Mexico, sometimes forms a small tree about 7 meters high. It has been confused with *Karwinskia Humboldtiana* Zuccarini, the type of the genus, which occurs from southern Mexico to northern South America. The generic name is in honor of the Bavarian Baron Karwinski von Karwin, who traveled in Brazil, and died in 1855.

The young twigs are finely and sparingly hairy, becoming smooth and light brown, or sometimes persistently hairy. The leaves are opposite, rather short-stalked, oval or oblong, entire-margined, strongly pinnately veined, blunt or bluntish, firm in texture, rounded at the base, 3 to 7 cm. long, smooth on both sides, dull, paler green on the under than on the upper surface; the leaf-stalks are 3 to 10 mm. long. The small green perfect flowers are in smooth axillary stalked clusters, longer than the leaf-stalks; the calyx is about 3 mm. broad, the 5 triangular pointed calyx-lobes about as long as the calyx-tube; there are 5 small hooded petals; the 5 stamens are a little longer than the petals; the ovary is 2-celled with 2 ovules in each cavity; the slender style is 2-lobed. The fruit is a nearly black round drupe, 10 to 12 mm. in diameter.



FIG. 626. — Northern Karwinskia.

V. THE BUCKTHORNS

GENUS **RHAMNUS** [TOURNEFORT] LINNÆUS

SOME 60 or 70 species of *Rhamnus* are known, widely distributed in America, Europe, Asia, and Africa. Most of them are shrubs, but a few form small trees. In North America, besides the 15 species recognized as natives of the United States and Canada, and the 2 European ones that have become naturalized with us (*Rhamnus cathartica* and

Rhamnus Frangula), one occurs in the West Indies, and several in Mexico and Central America. It was to *R. cathartica* Linnæus, the type species, to which the Greek name, now the name of the genus, was originally applied.

The Buckthorns have bitter bark, alternate simple usually toothed leaves, with small stipules, which fall away early, and small green clustered axillary flowers, either perfect or imperfect. The calyx is 4-lobed or 5-lobed, with a bell-shaped tube; there are 4 or 5 petals, each wrapped around a stamen, or in some species none; the 4 or 5 short stamens are alternate with the calyx-lobes, borne on the edge of the disk; the ovary is from 2-celled to 4-celled, each cavity containing 1 ovule; the style is short or slender, the stigmas as many as the cavities of the ovary; the fruit is a small drupe, containing 2 to 4 nutlets.

The arborescent forms of the United States may be distinguished as follows:

Leaves deciduous; flowers perfect; nutlets rounded on the back.

Peduncles shorter than the petioles; eastern tree.

1. *R. caroliniana*.

Peduncles longer than the petioles; western tree.

2. *R. Purshiana*.

Leaves persistent; flowers polygamous or diœcious; nutlets grooved on the back; Californian trees.

Leaves spinulose-serrate.

3. *R. ilicifolia*.

Leaves not spinulose, glandular-serrate.

4. *R. pyrifolia*.

1. INDIAN CHERRY — *Rhamnus caroliniana* Walter

This species grows along streams and on hillsides from Virginia to Florida, southern Ohio, Illinois, Kansas, and Texas, often a mere shrub, but sometimes forming a tree 12 meters high, with a trunk 2 dm. thick; it is also called Yellowwood and Polecat-tree.



FIG. 627. — Indian Cherry.

The bark is thin, smooth, or slightly furrowed, light gray. The young twigs are reddish brown and finely hairy, becoming smooth and gray. The leaves are oblong to elliptic, quite densely velvety-hairy when young, pointed, entire-margined, rounded or narrowed at the base, rather firm in texture, when mature 5 to 12 cm. long, dark green and somewhat shining on the upper surface, paler and smooth or slightly hairy on the under side; their stalks are 8 to 18 mm. long. The flowers are in small stalked hairy clusters in the leaf-axils, opening from April to June; the calyx-lobes are triangular-ovate, pointed, nearly or quite as long as the calyx-

tube; the 5 ovate notched petals are much shorter than the calyx-lobes; there are 5 very short stamens opposite the petals and partly enfolded by them; the ovary

is 3-celled. The fruit is nearly globular, about 10 mm. in diameter, black, usually containing 3 nutlets, which are rounded on the back; its flesh is sweet.

The wood is light brown, rather hard, weak, with a specific gravity of about 0.55.

2. CASCARA SAGRADA — *Rhamnus Purshiana* de Candolle

An important drug-plant, this Buckthorn occurs on hillsides and along streams from Montana to British Columbia, Colorado and central California. While often a shrub, it sometimes forms a tree 10 to 13 meters high, with a trunk up to 5 dm. thick. It is also known as Coffee-tree, Bitter-bark, Shittimwood, Bearberry, Wahoo, and several other local names.

The thin bark is brown and scaly, the young twigs finely hairy, green, becoming reddish brown and at length smooth, the small buds not scaly. The leaves are oblong or obovate, rather thin, short-pointed or blunt, smooth and dark green on the upper surface when mature, more or less hairy and yellowish green on the under side, finely and usually closely toothed, 3 to 18 cm. long, the base blunt or somewhat heart-shaped; the hairy leaf-stalks are 2.5 cm. long or less. The greenish perfect flowers appear in May or June in axillary hairy stalked clusters, but the tree often continues to flower on some twigs until late in the season; the flower-stalks are slender and 6 to 20 mm. long; the bell-shaped calyx is about 5 mm. long, its 5 or sometimes 4 pointed lobes about as long as the tube; there are 5 minute petals each wrapped around a short stamen; the ovary is 2-celled or 3-celled, the slender style tipped by a 2-lobed or 3-lobed stigma. The fruit is nearly round, black when ripe, juicy, containing 2 or 3 nutlets, which are rounded on the back, not grooved.



FIG. 628. — Cascara Sagrada.

The wood is reddish brown, weak, with a specific gravity of about 0.58. The bark is in high repute as a laxative and is collected in large quantities.

3. HOLLY-LEAVED BUCKTHORN — *Rhamnus ilicifolia* Kellogg

This small evergreen tree, or shrub, which has been confused with the smaller-leaved, darker green low shrub *Rhamnus crocea* Nuttall, is widely distributed in middle and southern California, and has been collected in Arizona. It grows on hillsides and mountain slopes in relatively dry soil, and occasionally forms a tree 6 or 7 meters high, with a maximum trunk diameter of about 2 dm.

Its bark is thin and gray. The young twigs are green, more or less hairy, turning reddish brown and becoming smooth. The buds are not more than 2 mm. long, their scales hairy-fringed. The leaves are firm in texture, ovate to oval or nearly as wide as long, sharply toothed with bristle-tipped teeth, smooth or very nearly so, yellow-green, blunt, pointed, or sometimes notched at the apex, blunt or narrowed at the base, 5 cm. long or less; the leaf-stalks are 2 to 10 mm. long. The polygamous or dioecious flowers are rather numerous in small clusters in the axils, and open from February to May, their stalks 2 to 5 mm. long; the 4 green calyx-lobes are about as long as the bell-shaped calyx-tube; there are usually no petals; the 4 stamens of the staminate flowers are about as long as the calyx-lobes, the anthers rather longer than the filaments; the pistillate flowers have 4 short rudimentary stamens, a 2-celled ovary with a slender style and 2 slender stigmas. The fruit is obovoid, red, 5 to 7 mm. long, its stalk about the same length; it contains 2 grooved nutlets.



FIG. 629. — Holly-leaved Buckthorn.

4. PEAR-LEAVED BUCKTHORN — *Rhamnus pyrifolia* Greene

Inhabiting, so far as known, only the islands off the coast of southern California, this small evergreen tree sometimes attains a height of 10 meters, with a trunk up to 2 dm. thick, but is sometimes shrubby. It has been confused with *Rhamnus insulus* of Kellogg, which is endemic on Cerros island, Lower California.

The bark is smooth, dark gray to nearly black, the young twigs densely and finely hairy, green, becoming brown. The leaves are oblong to broadly oval, firm in texture, short-stalked, smooth or nearly so on both sides when mature, blunt or rounded at both ends, or sometimes narrowed at the base, 2 to 7.5 cm. long, bright green above,



FIG. 630. — Pear-leaved Buckthorn.

yellow-green on the under side, toothed or nearly entire-margined, the low teeth gland-tipped, not bristly. The small polygamous or dioecious flowers open from March to May; the 4 lanceolate pointed calyx-lobes are about as long as the calyx-tube; there are no petals; the 4 stamens of the staminate flowers are somewhat shorter than the calyx-lobes. The fruit is scarlet, broadly obovoid, about 5 mm. long, containing 2 grooved nutlets.

Rhamnus cathartica Linnæus, the Purging buckthorn of Europe, has been widely planted for hedges in the eastern United States, and is locally naturalized. It has thorny branches, petaliferous flowers, and black fruit containing 3 or 4 nutlets. Usually a tall shrub, planted trees are known up to 9 meters high, with short trunks 3.5 dm. thick.

VI. CALIFORNIA LILACS

GENUS **CEANOTHUS** LINNÆUS



NOT fewer than 35 or 40 species of *Ceanothus* are known, natives of the United States, British America, and northern Mexico. Most of them are shrubs, some, such as the New Jersey tea (*Ceanothus americanus* Linnæus), the type of the genus, widely distributed in eastern North America, not over 6 or 7 dm. high; but at least 3 of the California species form small trees, and several others which are normally shrubs sometimes become tree-like.

They have alternate stalked leaves, often strongly 3-nerved, and small perfect flowers, usually very numerous in large clusters. The calyx is 5-lobed, the lobes curved inward; there are 5 hooded and clawed petals, each more or less enfolding a stamen with a filiform filament; the 3-lobed and 3-celled ovary is sunk in the disk and adnate to it, and there is a single ovule in each cavity. The fruit is dry, 3-lobed or nearly round, splitting when ripe into 3 valves.

The generic name is Greek, first applied to these plants by Linnæus, but used by the ancient authors for some wholly different group.

The North American arborescent species may be distinguished as follows:

Leaves smooth, or but little pubescent beneath.

Twigs unarmed.

Twigs tipped with spines.

Leaves densely white-tomentose beneath.

1. *C. thyrsiflorus*.

2. *C. spinosus*.

3. *C. arboreus*.

I. CALIFORNIA LILAC — *Ceanothus thyrsiflorus* Eschscholtz

This, the largest of the genus, sometimes attains a height of about 12 meters, with a trunk 3 or 4 dm. in diameter, but is usually much smaller and commonly a shrub. It is abundant on hillsides and along streams in western California, and is not known to grow naturally except in that State. It, its hybrids, and derivatives under cultivation, are largely planted in European and Californian parks

and gardens. Californian local names are Blue myrtle, Blue blossom, Wild lilac, and Tick tree.



FIG. 631. — California Lilac.

The thin red-brown bark is finely scaly. The young twigs are strongly ridged and angled, finely hairy, yellowish green, becoming smooth, round and brown. The leaves vary from oblong to ovate, and from 2 to 5 cm. in length; they are blunt or bluntish at the apex, narrowed or sometimes rounded at the base, finely toothed, 3-nerved, smooth and shining on the upper side, more or less hairy on the under surface, at least along the veins; the leaf-stalks vary from 4 to 12 mm. long. The dense compound hairy flower-clusters are 5 to 10 cm.

long, borne at the ends of twigs of the season; the flowers are blue or white, fragrant, and open from March to April; the sepals are broadly ovate, the claw of the petals as long as the blade or longer, the stamens as long as the petals or shorter. The 3-lobed fruit is black.

The wood is brown, soft, and weak, with a specific gravity of about 0.57.

2. SPINY CEANOTHUS — *Ceanothus spinosus* Nuttall

Inhabiting valleys and cañons in southern California, and usually a mere shrub, this species rarely forms a tree 6 or 7 meters high, with a trunk 1.5 dm. in diameter or less.

The bark is red-brown and scaly, the young twigs finely hairy, green, somewhat angled, becoming brown, some of them tipped by stout thorns 1 to 3 cm. long. The leaves are elliptic to oblong-obovate, blunt, bluntish or notched at the apex, narrowed at the base, 2 to 4 cm. long, pinnately veined, firm in texture, entire-margined, or those of shoots sometimes toothed, persistent during the winter, hairy on the under side when young, smooth or nearly so on both sides when old, the upper surface dark green, the under side paler. The compound, rather loose flower-clusters are 1.5 dm. long or less, borne at the ends of twigs;



FIG. 632. — Spiny Ceanothus.

the blue flowers open from March to May. The fruit is black, somewhat 3-lobed, about 7 mm. thick.

3. ISLAND CEANOTHUS — *Ceanothus arboreus* Greene

This small tree or shrub is confined, so far as known, to the islands near the coast of southern California. It becomes as much as 8 meters high, with a trunk 2.5 dm. in diameter, and is also known as Tree myrtle.

The young twigs are angular, densely white-velvety, becoming smooth, round and brown. The leaves are ovate to elliptic, blunt or pointed, finely toothed, thick, strongly 3-veined from the obtuse base, 5 to 10 cm. long, dark green and finely velvety on the upper side, densely white-velvety on the under surface; the stout leaf-stalks are 5 to 20 mm. long. The light blue



FIG. 633. — Island Ceanothus.

flowers are in rather dense white-velvety clusters at the ends of twigs and open from January to April. The fruit is black, 7 to 8 mm. thick.

The wood, which has a specific gravity of about 0.78, is hard, dense and reddish brown. The species has been confused with the widely distributed *Ceanothus velutinus*, which it resembles.

VII. NAKEDWOOD

GENUS *COLUBRINA* L. C. RICHARD

Species *Colubrina reclinata* (L'Heritier) Brongniart

Ceanothus reclinatus L'Heritier



THE genus *Colubrina* (Latin, from *coluber*, a serpent), named by Linnaeus, with reference to the snake-like ridges on the trunks of some species, includes about 15 species of shrubs and trees, most of them natives of tropical and subtropical America, one Asiatic. Of the West Indian species, two occur in southern Florida, one a tree, as described below, the other, *Colubrina Colubrina* (Linnaeus) Millspaugh, the type of the genus, a shrub; and there are two Texan shrubby species. They all have alternate, stalked

leaves, and small perfect flowers in axillary clusters; there are 5 calyx-lobes, 5 petals, 5 stamens, and the ovary is 3-celled with 1 ovule in each cavity. The fruit is 3-lobed, splitting when ripe into 3 valves.

The Nakedwood, or Soldier wood, inhabits extreme southern Florida, and is distributed throughout the West Indies from the Bahamas to St. Vincent and Jamaica. It attains a height of at least 20 meters, with a trunk up to 1.5 meters in diameter. The orange-brown bark is deeply irregularly furrowed and ridged, falling away in papery layers. The young twigs are finely hairy, reddish, becoming smooth, round, and brown. The leaves vary from ovate to elliptic or ovate-lan-



FIG. 634. — Nakedwood.

ceolate, and from 4 to 8 cm. in length; they are entire-margined, bluntly pointed, smooth when fully grown, the rounded or narrowed base bearing 2 glands; the slender leaf-stalks are usually 1 cm. long or more. The hairy flower-clusters are stalked, and as long as the leaf-stalks or shorter; the pointed calyx-lobes are keeled on the inner side; the hooded petals are shorter than the calyx-lobes, each enfolding a stamen; the rather slender style is 3-lobed at the top. The fruit is orange-red, nearly round, 8 or 10 mm. in diameter, splitting into three 2-lobed valves, each containing one black shining oblong seed.

The wood is dark brown, hard, strong, and heavy, its specific gravity being about 0.82.

THE LINDEN FAMILY

TILIACEÆ Jussieu



HIS family, comprising about 35 genera, with probably 375 species, consists of trees, shrubs, and a few herbs, which are widely distributed in temperate and tropical regions. The whole family is noted for the fibrous bark, which is of great economic importance, especially the product of the stem of the nearly herbaceous genus *Corchorus*, which yields the well-known Jute fiber.

The plants of the Linden family have simple leaves, which are alternate, seldom opposite, accompanied by small stipules that fall off early; the inflorescence is cymose, or sometimes paniculate; the flowers are regular and usually perfect, with 5, or rarely fewer, valvate, deciduous sepals; the petals are equal in number to the sepals or fewer, usually imbricated in the bud and often appendaged by a petal-like scale (staminode) at the base; stamens many, in sets of 5 to 10, or distinct, the filaments often forked; anthers 2-celled, erect or versatile; the ovary is free, 2- to 10-celled, usually sessile. The fruit is a nut-like drupe in the Lindens, in other genera sometimes berry-like and fleshy or capsular, 1- to 10-celled.

Besides the well-known Linden trees 2 herbaceous genera with 3 species enter the southern part of our area.

THE BASSWOODS

GENUS **TILIA** [TOURNEFORT] LINNÆUS



HIS genus is composed of some 20 species, all of which are trees of considerable stature, natives of the north temperate zone, widely distributed in eastern North America; one species occurs in the mountains of Mexico. In Europe they extend several degrees further north; they are not found, however, in western North America, nor in central Asia.

The leaves are alternate, stalked, unequally cordate or truncate at the base, serrate or crenate, sharply or taper-pointed, with early falling stipules. The white to yellow flowers are sweet and fragrant, in cymes, either axillary or terminal; the long peduncle is united through about half its length with a conspicuous light green bract; the 5 sepals are narrow and thickish; the 5 petals are alternate with the sepals, sometimes with a petal-like scale at the base, imbricate; the numerous hypogynous stamens are inserted upon a short receptacle; filaments thread-like, forked, collected into a group at the base of each petal-like scale, their anthers 2-celled, facing outward; the ovary is sessile, superior, 5-celled; style elongated,

erect; stigma 5-lobed; ovules 2 in each cavity. Fruit a globose nut-like drupe, with a hard coat, usually 1-celled; seeds 1 or 2 in each fruit, obovoid, the endosperm fleshy; embryo large, often curved; cotyledons broad, 5-lobed.

The inner bark or bast is tough, and is made into cordage, mattings, fish-nets, and shoes in northern Europe. The flowers are mucilaginous and are used in domestic medicine; the fragrant volatile oil obtained from the flowers is used in perfumery, and a highly prized honey is gathered by the bees which visit these trees when in blossom.

Several fossil species have been described from the Tertiary formations of Europe and America.

The generic name, adopted by Linnæus, was the classic name of the Linden, *Tilia europæa* Linnæus, the type of the genus. Our species are:

Leaves smooth beneath or very nearly so, sometimes glaucous.

Leaves green beneath, their teeth slender-tipped.

1. *T. americana*.

Leaves white-glaucous beneath, their teeth not slender-tipped; southern trees.

Cyme-branches smooth; staminodes entire.

2. *T. australis*.

Cyme-branches hairy; staminodes erose.

3. *T. floridana*.

Leaves mostly densely hairy beneath, not glaucous.

Leaves white, gray or silvery beneath.

Bracts mostly abruptly narrowed at the base, sessile or nearly so.

Leaves gray or silvery gray beneath, the hairs very short.

4. *T. heterophylla*.

Leaves white beneath, the hairs rather long, cottony.

5. *T. eburnea*.

Bracts mostly attenuate at the base, stalked.

6. *T. Michauxii*.

Leaves brown-hairy or rusty hairy beneath.

Leaves thick, firm, copiously hairy beneath.

7. *T. pubescens*.

Leaves very thin, sparsely hairy beneath.

8. *T. leptophylla*.

1. AMERICAN LINDEN — *Tilia americana* Linnæus

A stately tree, known also as Basswood, White-wood, and Whistle-wood, occurs in woods from New Brunswick to Manitoba, southward to Georgia and eastern Texas, reaching its greatest abundance about Lakes Erie and Ontario, where it sometimes forms exclusive forests. Its maximum height is about 40 meters, with a trunk diameter up to 1.5 meters. The branches incline to spread, and develop into an ample rounded head where the tree grows in the open.

The dark gray bark, 2 to 2.5 cm. thick, is longitudinally furrowed into flat ridges. The season's twigs are round, smooth, greenish to light gray or reddish, becoming darker the following year. The winter buds are often 1 cm. long, ovoid, pointed and red. The leaves are firm in texture, ovate to orbicular, 10 to 18 cm. long, and about two thirds as wide as long, unequally cordate to truncate at the base, long-pointed, deeply toothed, with sharp gland-tipped teeth; the upper surface is dark green and shining, the under side green and smooth, except for a few rusty hairs in the axils of the stronger veins; the leaf-stalk is slender, about one third as long as the blade. The bracts of the peduncles are decurrent upon

them to within 10 or 15 mm. of the base; they are 10 to 16 cm. long and 1 to 3 cm. wide, tapering at the base, blunt at the apex and smooth; there are .5 to 20 flowers in each cluster. The sepals are ovate-lanceolate to lanceolate, 6 to 8 mm. long, somewhat shorter than the wedge-shaped blunt pale yellow petals, which are about as long as the spatulate staminodes. The ovary is woolly and ripens into an ovoid fruit 10 to 12 mm. long, often tipped by the base of the style; the broadly ovoid seed is about 5 mm. long.

The wood is soft, quite tough, close-grained, light brown or reddish, with a specific gravity of about 0.45. It is largely used in general carpentry, for furniture, carriages, woodenware, and in great quantities for paper pulp. The tree blossoms in May or June; it is one of the best ornamental trees for planting in the northern States, its freedom from insect pests, handsome foliage, and large and fragrant flowers making it more desirable than the European Lindens.



FIG. 635. — American Linden.

2. SOUTHERN BASSWOOD — *Tilia australis* Small

This medium-sized linden attains a height of 20 meters and a trunk diameter of 2.5 dm. It is little known outside of the type locality in north central Alabama, where it occurs in the higher valleys, particularly in Blount county.



FIG. 636. — Southern Basswood.

The twigs are rather slender, reddish brown, becoming darker and rougher with age. The winter buds are small and ovoid. The leaves are thin but firm, ovate to oval-ovate, 7 to 17 cm. long, obliquely heart-shaped to nearly truncate at the base, abruptly taper-pointed, serrate, the teeth tipped with prominent glands; the upper surface is deep green and somewhat glossy, the under side glaucous

and smooth, or nearly so. The bracts are oblong to narrowly obovate, 10 to 13 cm. long, 3 to 4 cm. wide, sessile or short-stalked, smooth and glaucous on either surface. The peduncle is smooth, the free portion 2 to 4 cm. long, with from 5 to 10 medium-sized flowers; the sepals are narrowly ovate to ovate-lanceolate, 3.5 to 4 mm. long; the petals are 5.5 to 7 mm. long; the staminodes are entire, linear-spatulate, slightly shorter than the petals. The fruit is globose.

3. FLORIDA BASSWOOD — *Tilia floridana* Small

This, the smallest of the American species of *Tilia*, scarcely exceeds 9 meters in height, with a trunk about 1.5 dm. in diameter.

The bark is somewhat furrowed and not very thick. The leaves are thin, ovate or oval-ovate, 4 to 11 cm. long, 2 to 6 cm. wide, unequally subcordate or truncate at the base, abruptly short taper-pointed at the apex, serrate, the teeth tipped with prominent glands; the upper surface is smooth, deep green, the lower glaucous, somewhat hairy when young, glabrous or nearly so at maturity; the petiole is stout, rather short, 2 to 3 cm. long. The bracts are decurrent to within 0.5 to 1.5 cm. of the base of the peduncle, rather small, 7 to 10 cm. long, 1 to 2 cm. wide, rounded at the apex, somewhat hairy; the pedun-



FIG. 637. — Florida Basswood.

cle is hairy, the free portion 0.5 to 1.5 cm. long, few- to many-flowered; the sepals are lanceolate to linear-lanceolate, 3 to 3.5 mm. long; the petals 4.5 to 5.5 mm. long; the staminodes are almost linear or linear-spatulate, irregularly margined, somewhat shorter than the petals. The fruit is globose, 5 to 6 mm. in diameter, covered with brownish gray hairs.

A rare species as yet known only from the vicinity of Jacksonville, and in Orange county, Florida.

4. WHITE LINDEN — *Tilia heterophylla* Ventenat

Also called Bee-tree, Wahoo, Silver-leaved linden, and White basswood, this is a tree slightly smaller than the American linden, attaining a maximum height of about 30 meters, with a trunk diameter of 1 to 1.25 m. It grows in rich woods, mostly in mountainous regions, from western New York to Illinois, Tennessee, Alabama, and Florida, reaching its greatest development in the southern Alleghanies.

The bark is about 1.25 cm. thick, furrowed, and separates into short, flat scales of a light brown color. The twigs are round, smooth, greenish to light red, becoming brown with age. The winter buds are broadly ovoid, flattened, and red. The leaves are 12 to 20 cm. long, scarcely two thirds as wide, variable in outline, oblong-ovate to orbicular-ovate, oblique and cordate to truncate at the base, short taper-pointed, toothed with short, abruptly pointed teeth; the upper surface is dark green and smooth, the under side white or grayish and finely hairy; the leaf-stalk is slender, about one fourth the length of the blade. The bracts of the peduncles are sessile or nearly so, abruptly narrowed to the base, bluntish at the apex, 9 to 15 cm. long, about 2 cm. wide, and somewhat hairy. The free portion of the peduncle is rather long and bears from 5 to 15 flowers. The sepals are ovate-lanceolate to oblong-lanceolate, rather sharply pointed, slightly shorter than the narrow petals, which are 7 to 9 mm. long; the spatulate staminodes are one fourth shorter; the style is longer than the petals; the woolly ovary ripens into a globose ashy gray fruit 7 to 9 mm. in diameter.

The wood is soft and close-grained, light brown; its specific gravity is about 0.42; it has more prominent medullary rays, but is not distinguished from the wood of the American linden in commerce.



FIG. 638. — White Linden.

5. ASHE'S LINDEN — *Tilia eburnea* Ashe

A small tree reaching a height of 22 meters, occurring in the foothills of middle North Carolina, South Carolina, and northern Georgia. It is also called the Blue Ridge lin.

The bark is furrowed, dark gray-brown on the trunk, smoother and of a silver gray color on the branches; the twigs are smooth or somewhat glaucous, green-red to reddish brown, becoming gray with age; the buds are quite large, ovoid, smooth, somewhat glaucous. The leaves are thick, 8 to 14 cm. long, ovate to orbicular-ovate, abruptly taper-pointed and unequally cordate or truncate at the base, sharply toothed on the margin, dark green and smooth above, the lower surface densely woolly, becoming less so as the leaf matures; the rather slender leaf-stalk is smooth, sometimes glaucous, one third the length of the blade. The bracts are oblong to spatulate, decurrent to the base of the peduncle or nearly so, rounded at the apex, more or less so at the base, 7 to 11 cm. long, one fourth as wide, glabrate above, usually soft hairy beneath; the peduncle is about two thirds the length of the bract, its free portion short, with few (2 to 6) rather small flowers;



FIG. 639. — Ashe's Linden.

the sepals are ovate-lanceolate; the petals are 5 to 6 mm. long, the staminodes spatulate; ovary brown-tomentose. The fruit is nearly globular, 5 to 7 mm. in diameter, not pointed.

This recently described Linden is very little known except from the original description and a few herbarium specimens, and it may not be specifically distinct from the preceding species. Its wood is probably very similar to that of the other Lindens and used indiscriminately as such. The flowers open about the middle of June, a little earlier than those of the White

linden, whose flowers are somewhat larger. If it should prove hardy at the North it would be a most desirable addition to the list of trees available for ornamental planting.

6. MICHAUX'S BASSWOOD — *Tilia Michauxii* Nuttall

Tilia alba F. A. Michaux, not Linnæus

This magnificent tree occurs from Pennsylvania and Ohio south to Georgia and Alabama. It grows in rich soil along streams, seldom occurring upon the hills, reaching a maximum height of 30 meters, with a proportionately thick trunk. The silvery gray, rather smooth bark of the branches is in contrast to the darker, broadly furrowed bark of the trunk. It is also called White basswood.

The leaves are firm, rather large, 7 to 22 cm. long, cordate or rarely truncate at the very oblique base, taper-pointed and sharply-toothed, bright green and shining above, gray- or silvery-woolly beneath; the slender leaf-stalk is 3 to 5 cm. long;



FIG. 640. — Michaux's Basswood.

the bracts of the peduncles are decurrent upon them to within from 1 to 3 cm. of their base; they are spatulate, 8 to 14 cm. long, 1 to 2.5 cm. wide, usually tapering at the base, somewhat rounded at the apex, the lower surface slightly hairy. The smooth peduncles are free from the bracts for 4 to 5 cm., and bear 8 to 15 large, light yellow flowers; the sepals are narrowly ovate to oblong-lanceolate, 4.5 to 6 mm. long; the petals are elliptic, 6 to 10 mm. long, slightly larger than the spatulate staminodes. The globose fruit is 6 to 8 mm. long.

This tree is distinguished from the American linden by its large white-woolly leaves and the smoother, lighter colored bark of the branches. Our statement of the economic applications of the American linden is equally applicable to this species, while as an ornamental tree its larger silvery leaves and larger and later flowers are additional merits.

7. DOWNY BASSWOOD — *Tilia pubescens* Aiton

A small tree, also called the Southern basswood, seldom exceeding 15 meters in height, with a trunk diameter of 3 to 5 dm. It occurs in moist, rich woods, usually near the coast, from Virginia south to Florida and westward to Louisiana. It is nowhere very abundant, but is most common in South Carolina and Georgia. The reports of its being found as far north as Long island are based on a misunderstanding of the species.

The bark is 12 to 16 mm. thick, coarsely furrowed and broken into reddish brown scales. The season's twigs are slender and densely covered with rusty down, which persists more or less until the second year, when they are reddish brown; the winter buds are sharp-pointed, dark red-brown and slightly hairy. The leaves are thick and firm, ovate to broadly ovate, 8 to 18 cm. long, obliquely truncate or slightly cordate at the base, short- or long-pointed and coarsely toothed; the young leaf is very hairy, but becomes smooth on the upper surface when fully grown, the lower surface remaining covered with a dense rusty-brown down: the leaf-stalk is slender, 3 to 4 cm. long, and very hairy; the bracts are sessile, oblong to oblong-spatulate, 6 to 9 cm. long, 1.5 to 2 cm. wide, narrowed or rounded at the base, very downy on the under side. The peduncle and pedicels are hairy; the many flowers are rather small; the sepals are lanceolate, 3.5 to 4.5 mm. long; the oblong petals are 6 to 7.5 mm. long, twice the length of the spatulate staminodes. The white-woolly ovary ripens into a globose fruit 6 to 8 mm. in diameter.

The wood of this tree is similar to that of the American linden, except that it is lighter in weight, having a specific gravity of about 0.40; it is used like that of its well-known relatives.



FIG. 641. — Downy Basswood.

8. TEXAS BASSWOOD — *Tilia leptophylla* (Ventenat) Small*Tilia pubescens leptophylla* Ventenat

This tree much resembles the Downy basswood, being considered merely a variety of it by some authors. It is smaller in all its parts and smoother. It occurs in low woods of southern Louisiana and southeastern Texas, extending north to Missouri.



FIG. 642. — Texas Basswood.

Its leaves are thin and membranous, ovate to broadly ovate, 6 to 9 cm. long, unequally truncate or subcordate at the base, abruptly long-pointed, remotely toothed with coarse teeth; the upper surface is rather smooth and light green, the under side somewhat hairy; the leaf-stalk is slender, 2.5 to 4 cm. long. The bracts are sessile or nearly so, small, 6 to 8 cm. long, 1 to 2.5 cm. wide, abruptly tapering at the base, bluntly rounded at the apex, smooth above and hairy beneath. The free portion of the peduncle is about 3 cm. long and bears 3 to 7 small flowers or more. The sepals are broadly lanceolate, about 7 mm. long, about equal in length to the oblanceolate-obovate petals; the spatulate staminodes are 1 mm. shorter. The fruit is globose, about 8 mm. in diameter, and very hairy.

THE MALLOW FAMILY

MALVACEÆ Necker



MALVACEÆ consist of about 40 genera, including some 800 species, mostly herbs, some shrubs, and a few tropical trees. They are of world-wide distribution, except in cold climates, the well-known weed *Malva rotundifolia* Linnæus reaching farthest north, in Russia. Although they mostly keep to low altitudes, a few alpine forms exist in the higher Andes of South America.

They abound in a mucilaginous principle and in fibrous tissue, thus becoming of the greatest economic importance, cotton, the fibrous appendage to the seed of various species of *Gossypium*, being their most valuable product.

The leaves of the Mallow family are simple and alternate, their stipules small and deciduous. The flowers are variously clustered, or solitary, always regular and generally perfect, some being very large. The 5, rarely fewer, sepals are valvate, more or less united and frequently subtended by an involucre of a number of narrow bracts. The petals, also 5 in number, are hypogynous and convolute. The many hypogynous stamens are united into a column enclosing the pistil, their bases united with those of the petals; anthers kidney-shaped, 1-celled. The ovary has several cavities; styles united upward from their bases but free above, usually projecting beyond the stamen-column and generally equaling the ovary-cavities in number. The fruit is a several-celled capsule, rarely a berry. Seeds kidney-shaped, globose or obovoid, hard or brittle, smooth or rough, sometimes hairy; endosperm scant, fleshy, mucilaginous; embryo large, curved, or folded; cotyledons leafy.

One tropical arborescent species occurs in southern Florida.

SEASIDE MAHOE

GENUS **THESPESIA** SOLANDER

Species ***Thespesia populnea*** (Linnæus) Solander

Hibiscus populneus Linnæus



ALSO called Umbrella tree, Tulip tree, and Portia tree in the East Indies,* Poppy tree, Poplar, and Catappa in the West Indies, this rarely enters our area on the Keys of southern Florida, where it is a low tree 2 to 4 meters high, but often a shrub with stout round twigs; it is common in the West Indies, introduced from the Old World tropics.

The leaves are leathery, heart-shaped, sometimes slightly wavy-margined, taper-pointed, 5 to 12 cm. long and nearly as wide, the leaf-stalk nearly as long as the blade. The flowers are axillary, on stout peduncles shorter than the petals, which



FIG. 643. — Seaside Mahoe.

are large and showy, yellowish with a purple base, to which color the whole flower changes toward the end of the day; the involucre of 3 to 5 linear bracts falls away early; the calyx is cup-shaped and entire; petals 5, each 4 to 7 cm. long; stamens numerous; ovary sessile, 5-celled, containing few erect ovules in each cavity, the 5 styles with decurrent stigmas. The fruit is a firm, leathery, roundish, depressed capsule, 3 to 4.5 cm. in diameter, 1.5 to 2 cm. high, 5-celled, indehiscent or sometimes opening slightly at the top; seeds 2 or 3 in each cavity, 1 cm. long and hairy.

The wood is hard, pale red or brown, strong, even-grained, its specific gravity about 0.80. It is durable under water and is a favorite for boat-building; also used in the manufacture of furniture and many objects of special local utility; the bast of the young shoots is utilized as a fiber; a yellow dye is said to be obtained from its juice and a fixed oil is expressed from the seed.

This tree is of rapid growth in tropical countries, where it often reaches a height of 15 meters, and is planted as a shade tree, for which its head of dense foliage makes it well adapted.

The generic name is Greek, meaning divine or exalted. There are about 4 species known, all natives of tropical regions; our species is the type.

Rose of Sharon, *Hibiscus Syriacus* Linnaeus, or Shrubby Althæa, as it is also called, is a native of western Asia, but has been a garden plant for a great many years and is now known in a large number of forms. It is much used for ornamental hedges, and has locally escaped to roadsides and waste places from southern Pennsylvania and New Jersey southward; it is usually a shrub 1 to 6 meters tall, rarely assuming the aspect of a tree unless artificially trained to do so. The leaves are deciduous, more or less 3-lobed, and coarsely scalloped; the white to rose-colored flowers are subtended by an involucre of distinct bracts and have distinct spreading styles; the capsules are oblong-ovoid, each cavity usually containing 2 seeds.

Mahoe, *Paritium tiliaceum* (Linnaeus) Jussieu, a shrub or small tree found throughout the tropics, also occurs as a shrub on some of the Florida Keys. The heart-shaped leaves are shallowly toothed, abruptly taper-pointed, prominently veined beneath, from 1 to 2 dm. in diameter, and long-stalked; the yellow flowers are subtended by a cup-shaped, 8 to 10-lobed involucre; the styles are distinct; capsules oblong. The bark furnishes a strong fiber, remarkably durable in water, and is made into rope, for local use, wherever the plant is abundant.

THE CHOCOLATE FAMILY

STERCULIACEÆ Ventenat



STERCULIACEÆ include about 50 genera, containing upward of 750 species of trees, shrubs, and herbs, widely distributed in tropical and semi-tropical regions. The most important product of this family is Chocolate, derived from the seed of *Theobroma Cacao* Linnæus.

The *Sterculiaceæ* have alternate leaves which are simple or compound, entire, toothed or deeply lobed, petioled and accompanied by free stipules, which fall away early. The flowers are usually perfect, regular or irregular, and clustered into panicles, racemes, or spikes, seldom solitary. The 5 sepals are more or less united at the base. The petals are of the same number as the sepals, or wanting. The numerous stamens are variously grouped, or united into a tube, many of them often being sterile; the anthers are 2-celled, facing outwardly and opening lengthwise. The pistil consists of 5 carpels or seldom fewer, more or less united, with an equal number of styles either distinct or united. The fruit is a capsule, follicle, or seldom a drupe, having few or many seeds which are variously shaped, angular, or winged, smooth or hairy.

Six genera with 8 species, all low and more or less shrubby, together with the following introduced tree occur in the southern portion of the United States.

CHINA PARASOL TREE

GENUS **FIRMIANA** MARSIGLI

Species ***Firmiana platanifolia*** (Linnæus) R. Brown

Sterculia platanifolia Linnæus



THIS species, also called the Japanese varnish tree, is a native of eastern Asia, and was introduced into the southern States as an ornamental shade-tree, where it is now naturalized in thickets and by roadsides in Georgia and other Gulf States. It is a rapid-growing, round-headed tree, up to 12 meters tall, with a smooth bark and stout soft twigs.

The leaves are large, alternate, orbicular or reniform in outline, 1 to 3 dm. broad, more or less deeply 3- to 5-palmately lobed, the lobes usually blunt-pointed, very hairy on the under side but comparatively smooth above, the stout leaf-stalk as long as the blade or longer. The numerous greenish flowers are borne in panicles up to 12 dm. long; the bell-shaped calyx is composed of 5 sepals, which are linear-lanceolate, 8 to 10 mm. long, reflexed and somewhat petal-like; there is no

corolla. The stamens, springing from the calyx-tube, are united into a broad column with about 15 anthers. The ovary is composed of 5 carpels, each having a more or less lobed stigma. The fruit is a leathery capsule which opens before maturity into 5 distinct follicles 6 to 9 cm. long, 3 to 3.5 cm. wide, veiny and hairy, supported by stalks about 2 cm. long and widely spreading, with 1 to 3 globular seeds about 6 mm. in diameter exposed on each inner margin.



FIG. 644. — China Parasol Tree.

The wood is very soft, white, and very light in weight. The bast of the young twigs is used for fiber and the seeds are used in Chinese medicine. In this country it has been planted for ornament and shade, and is hardy as far north as Washington, D. C. There are about 10 other species, nearly all Asiatic, this one being the type. The genus was named in honor of Karl Joseph Firmian, who was Governor-General of Lombardy about 1782.

THE HAND-TREE FAMILY

CHEIRANTHODENDRACEÆ A. Gray



HIS small family was proposed by Dr. Asa Gray, to include two closely related monotypic genera of otherwise uncertain affinities, our *Fremontia*, and *Cheiranthodendron platanooides* Baillon, the Mexican hand tree, so named on account of the hand-like arrangement of its conspicuous long red anthers. They are both American, the former native of California, the latter of Mexico.

The Hand-tree family have alternate leaves, which are more or less palmately lobed, rather thick, generally covered with stellate hairs, and provided with small, early-falling stipules. The showy axillary flowers are subtended by 3 bracts. The calyx is deeply 5-parted and petal-like. There is no corolla. The stamens are more or less united at the base, their upper portions being alternate with the lobes of the calyx and terminated by long adnate 2-celled extrorse anthers. The ovary is 5-celled, each cell containing many horizontal anatropous ovules; the filiform style is terminated by a small stigma. The fruit is a 5-celled dehiscent capsule. The seeds are oval, smooth and crustaceous, with fleshy endosperm, the embryo small and erect, the cotyledons flat and leaf-like.

FREMONTIA

GENUS **FREMONTODENDRON** COVILLE

Species ***Fremontodendron californicum*** (Torrey) Coville

Fremontia californica Torrey



FREMONTIA is found only in California, reaching its greatest development on the foothills of the western slope of the Sierra Nevada, where its maximum height is about 9 meters, with a trunk diameter of 3 to 3.5 cm. Its trunk is short; the branches are stout, stiff, and widely spreading. It is nowhere common and is usually a much branched shrub rather than a tree.

The bark is furrowed, 6 mm. thick, of a dark reddish brown color, and scaly. The round, stout twigs are covered by rough brown hairs. The leaves are 3- to 5-lobed, 2.5 to 3.5 cm. long, 1.5 to 2.5 cm. wide, the stout petiole 0.5 to 1.5 cm. long; they are thick, light green above, prominently nerved and rough beneath. The flowers are short-stalked, with an involucre of 3 or rarely 5 early-falling bracts; the hairy calyx is deeply 5-cleft, the obovate spreading lobes, 2.5 cm. long, are

bright yellow and petal-like; stamens united for half their length into a column; the adnate anthers are oblong-linear, 2-celled, facing outwardly and opening lengthwise; the pistil has a 5-celled ovary with a long style and pointed stigma. The fruit is a 5-celled capsule 2 to 2.5 cm. long, 1.5 to 2 cm. in diameter, covered with long stiff hairs on the outer surface, and soft-woolly hairs within, each cell containing 2 to 4 ovoid hard seeds 7 mm. long.



FIG. 645. — *Fremontia*.

The wood is hard, close-grained, red-brown; its specific gravity is about 0.71.

This tree was called Slippery elm by the earlier settlers of California, on account of the resemblance of its inner bark to that of the well-known eastern tree, its mucilaginous nature making it available, as such, for poultices.

The generic name is in commemoration of Colonel John Charles Fremont, the distinguished explorer, who first discovered this tree.

THE WILD CINNAMON FAMILY

CANELLACEÆ Martius



HIS family contains 4 genera, with about 7 species of trees indigenous to tropical America, and is of economic importance principally for yielding the light yellow bark called Wild cinnamon, or Canella bark, a spice and aromatic tonic.

The *Canellaceæ* have alternate, simple, entire, evergreen punctate leaves without stipules; the flowers are perfect and regular, in corymbose cymes; the calyx consists of 3 thick imbricated sepals, the corolla of 4 to 12 narrow imbricated petals or sometimes more; stamens numerous, borne with the petals, their filaments united into a tube encircling the ovary; anthers extrorse, joined to the filament-tube; ovary free, of 2 to 5 united carpels, 1-celled, with 2 to 5 parietal placentæ; style stout; stigma 2- to 5-lobed; ovules 2 to many, horizontal. Fruit a 2- to several-seeded berry; seeds shining and crustaceous; endosperm fleshy; embryo straight or slightly curved.

One genus, with a single species, occurs in our area.

CINNAMON WOOD

GENUS **CANELLA** PATRICK BROWNE

Species **Canella Winterana** (Linnæus) Gærtner

Laurus Winterana Linnæus. *Canella alba* Murray



SMALL tree, also called Canella bark, Whitewood, and Wild cinnamon, of frequent occurrence on the Florida Keys and throughout the West Indies to Venezuela. Its maximum height is about 15 meters, with a trunk diameter of 2.5 dm.

The trunk is short, the branches slender, more or less outspreading, the tree round-topped; the bark is about 3 mm. thick, separating into thick light gray scales; the inner bark is about 1 mm. thick, buff-colored, very spicy and aromatic. The twigs are stout, round, gray, and bear large leaf scars. The leaves are alternate, leathery, oblanceolate, spatulate or oblong-spatulate, 3 to 10 cm. long, blunt at the apex, narrowed at the base, slightly revolute on the margin, deep green and shining above, pale and pellucid-punctate beneath; the leaf-stalk is short, stout, winged and grooved. The flowers are in many-flowered cymes, which are terminal or sometimes in the upper axils, about 4 cm. across; the calyx has 3 orbicular or kidney-shaped, concave, leathery sepals, which are erect, very thick, half the

length of the petals, and fringed on the margin; corolla of 5 oblong petals 4.5 to 5 mm. long, blunt, concave, thick, fleshy, purple and deciduous; the stamens are 15 to 20, the filaments united into a tube 3 mm. high; anthers linear, 2-valved, opening lengthwise; ovary cylindric or oblong-conic; the style is short and fleshy, the stigma 2- or 3-lobed. The fruit, which mostly ripens in the spring, is a crimson subglobose berry 12 to 15 mm. in diameter, tipped by the persistent style and sub-



FIG. 646. — Cinnamon Wood.

tended by the persistent calyx; seeds few, obovate to kidney-shaped, black and shining, their endosperm copious.

The wood is very hard, close-grained, and reddish brown; its specific gravity is about 0.99. The berries are a favorite food of birds. The bark is largely used in the tropics as a condiment and it is valued in medicine for its aromatic tonic properties. The genus consists of 2 species, this one being the type. Canella is the Spanish name of Cinnamon.

THE BALSAM-TREE FAMILY

CLUSIACEÆ Lindley



CLUSIACEÆ comprise some 12 genera with about 125 species of trees or shrubs with yellowish, milky sap, natives of the warmer portions of both hemispheres. They are of considerable local economic importance, the concrete milky juice of many being used both medicinally and mechanically; of the former, Gamboge, a gum resin obtained from *Garcinia Hanburyi* J. D. Hooker, is powerfully purgative and poisonous in overdoses; it is also used as a yellow coloring and is official in all modern Pharmacopœias; others are used externally for healing purposes, and as we would use pitch in boat-building. Several edible fruits, the finest of them, and claimed by many to be the most delicious of all known fruits, is the Mangosteen, the fruit of *Garcinia Mangostana* Linnæus, of the East Indies, where it is largely cultivated in many improved varieties. In tropical America the Mammee apple, the large fruit of *Mammea americana* Linnæus, is much used.

The *Clusiaceæ* have opposite, sometimes whorled, entire leaves. The flowers are mostly diœcious or polygamous in few-flowered cymes, or solitary. The calyx consists of 2 to 16 strongly imbricated sepals, usually thick, leathery and persistent; the corolla is large, white, pink or yellow, of 4 to 9 petals; the stamens are mostly numerous, sometimes reduced in the pistillate flowers, their filaments more or less united; the pistils consist of 2 to many united carpels; ovary 2- to many-celled, its base surrounded by the united filaments; styles very stout or none; stigmas thick; ovules several to many. The fruit is drupaceous or capsular, the seeds sometimes arillate; endosperm none.

One species belonging to this family has been found in our area, or perhaps two.

BALSAM TREE

GENUS **CLUSIA** [PLUMIER] LINNÆUS

Species *Clusia flava* Jacquin



HIS evergreen tree or shrub is also called Bull Bay; it is an epiphyte, germinating on the trunk or branches of other trees and sending down aerial roots, which, upon reaching the soil, enter and finally become the trunk. It has a thick, yellow, milky sap, and is reported to have grown on Key West many years ago; it extends southward through the West Indies to tropical America, and is also called Monkey apple and Fat pork. Its

maximum height is about 20 meters, with a trunk diameter of 1.5 dm. The twigs are stout, smooth, yellow-green or gray, and roughened by large leaf scars.

The leaves are thick and leathery, cuneate-obovate, 5 to 15 cm. long, blunt or notched at the apex, wedge-shaped at the base, narrowed to the short, broad leaf-stalk, entire on the margin, yellowish green, smooth and shining above, paler, smooth and finely veined beneath. The flowers are few, clustered in cymes; calyx of 8 to 16 imbricated sepals, which are thick, leather-like, and suborbicular; the corolla has 4 broad obovate petals 2.5 to 3 cm. long, leathery, yellow, sometimes slightly unequal; stamens short and thick, several to many in the staminate flowers, none in the pistillate flowers. The fruit is a pear-shaped or globular, leathery capsule, and splits into about 12 segments; seeds usually 12, globular, surrounded by a soft pulp.

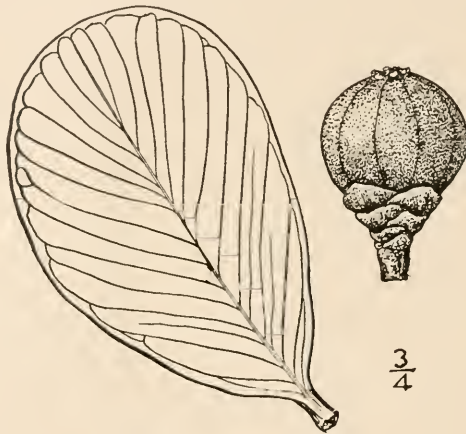


FIG. 647. — Balsam Tree.

The gummy exudation is used in the West Indies as a dressing for wounds, and the bites of insects.

No species of the genus is known to inhabit Florida at the present time, but there is evidence that another one, perhaps *Clusia rosea* Linnæus, formerly existed on Pine Key and Key West; further exploration of the Keys may still reveal one or the other.

The genus is composed of about 80 species, confined to tropical and subtropical America. The name is in commemoration of Charles de l'Ecluse, a French botanist of the sixteenth century. The type species is *Clusia major* Linnæus, of the West Indies.

THE TAMARISK FAMILY

TAMARICACEÆ Lindley



HIS family comprises 4 genera, with nearly 100 species of trees, shrubs, or partly woody herbs, natives of southern Europe, northern Africa, and central and southern Asia. They are peculiarly ornamental, but of little economic value. The bark is astringent, and has been used in tanning and dyeing.

Tamaricaceæ have alternate entire, usually very small or scale-like, often imbricated leaves without stipules. The small flowers are mostly perfect, regular, in spikes, racemes, or panicles; the calyx consists of 5, rarely 4 or 6, imbricated sepals; the corolla of an equal number of distinct petals; stamens 5 to many, their filaments free and distinct, the anthers opening lengthwise; ovary of 2 to 5 united carpels, superior, upon a 10-lobed or obsolete disk, 1-celled, with 3 to 5 basal placentas; styles 3 to 5, distinct; ovules 2 to many on each placenta. Fruit a dry capsule, its seeds erect, small, each terminated by a tuft of hairs; there is no endosperm. One species has become naturalized in our area.

TAMARISK

GENUS **TAMARIX** LINNÆUS

Species **Tamarix gallica** Linnæus



HIS small tree or shrub of southern Europe is cultivated for ornament from Massachusetts southward, and has become naturalized in the southern States, especially in Texas, where it occurs in thickets, waste places or roadsides, and reaches a height of 6 meters, with a trunk diameter of 3 dm.; also in Bermuda, the Bahamas and Haiti. It is also known as French tamarisk, Heath, Cypress, and Flowering cypress.

The branches are slender, wand-like, and spreading. The bark is thin, fissured into flat, elongated, dark brown ridges. The twigs are numerous, somewhat clustered, pendulous, slender and round, purplish red, and entirely covered with thin, imbricated scale-like leaves; these are awl-shaped, about 1 mm. long, sharp-pointed, glaucous, whitish or bluish, persistent in mild climates. The very small flowers appear in summer, are nearly sessile, in conspicuous slender panicles 2 to 3 dm. long, of numerous spikes; the calyx has 5 triangular persistent sepals about 0.5 mm. long; the corolla is white or pink, deciduous; the stamens have free filaments, thickened at the base; ovary free, sharp-pointed. The fruit is a pyramidal capsule about 1 mm. long, with many small seeds.

Its wood is quite hard and tough, rather strong, coarse-grained, and light reddish in color.

The bark is sometimes used in tanning and dyeing, also the galls caused by the sting of a coleopterous insect, known as Mogador galls; these are a source of tannic acid, of which they contain about 40 per cent. A saccharine exudation of this or a closely related species in Arabia, also caused by the puncture of an



FIG. 648. — Tamarisk.

insect, constitutes the Tamarisk or Jews' manna. Crude brushes are made from the twigs.

The genus, of which our plant is the type species, contains about 60 others, all natives of the Mediterranean region or the East Indies, several of which are cultivated in our gardens. The name is derived from that of an Asiatic river, on which these plants grew in abundance.

THE TEA FAMILY

THEACEÆ de Candolle



HIS family comprises about 16 genera, with some 175 species of trees, shrubs, and a few climbing vines, inhabiting the tropics and warmer temperate regions of Asia and America and represented in our area by 4 genera each with 1 species, 2 of which are arborescent. It is very important economically on account of the Tea plant, *Thea viridis* Linnaeus, native of southeastern Asia, the prepared leaves of which yield the well-known beverage, Tea. Several members of this family are great favorites in the gardens of warmer temperate regions and in conservatories, best known among these being the Camellia, *Camellia japonica* Linnaeus, now occurring in many varieties of doubled and variously colored flowers.

The *Theaceæ* have alternate, usually simple, rarely digitately divided, persistent or deciduous leaves without stipules. The flowers are usually large and showy, perfect and regular, axillary and solitary or sometimes in crowded racemes or panicles, often subtended by several bracts. The calyx consists of 5, or rarely 4 to 7 imbricated sepals; the corolla divisions are the same in number, sometimes slightly united, imbricated; the stamens are as many as there are corolla-segments or several times as many, the filaments various; anthers erect or versatile, opening lengthwise or by apical pores; the pistil consists of 3 to 5 united carpels; ovary 3- to 5-celled, sometimes partially immersed in the receptacle; styles as many as there are cells of the ovary or sometimes united; stigmas various; ovules 2 to many in each cavity. The fruit is a leathery or woody capsule; seeds few to many; endosperm usually wanting, or, if present, fleshy; embryo straight or oblique; cotyledons flat or fluted.

Our arborescent genera are:

Leaves deciduous, membranous; flowers nearly sessile, capsules globose; seeds angled.

1. *Franklinia*.

Leaves persistent, leathery; flowers on long pedicels; capsules ovoid; seeds winged.

2. *Gordonia*.

I. FRANKLINIA

GENUS **FRANKLINIA** MARSHALLSpecies **Franklinia altamaha** Marshall*Gordonia altamaha* Sargent. *Gordonia pubescens* L'Heritier

DECIDUOUS small tree or shrub of very local occurrence, discovered by the Bartrams in 1765 near Ft. Barrington, along the Altamaha River in Georgia, and later cultivated in their celebrated garden at Philadelphia, and seen again at the original locality by Moses Marshall, 25 years later. It is not known to have been found wild since, and at the present time is only known from cultivated specimens in gardens and parks. Its maximum known height is 7 meters, with a trunk diameter of 3 dm. It is sometimes called the Franklin tree.

FIG. 649. — *Franklinia*.

The branches are stout, slightly angular. The bark of young stems and branches is thin, smooth, gray, or reddish brown to dark brown. The twigs are rather slender, round and hairy. The leaves are membranous, oblanceolate or oblong-obovate, 6 to 15 cm. long, blunt or sharp-pointed, narrowed at the base, sharply saw-toothed above the middle, or nearly to the base, deep green and shining, with impressed and slightly hairy midrib above, pale and thickly hairy, with prominent midrib beneath; they turn scarlet before falling; the leaf-stalk is hairy, grooved, and short. The fragrant flowers appear in July and continue until stopped by frost;

they are solitary in the axils of the upper leaves, on stalks less than 1 cm. long; the 5 sepals are very unequal, concave, orbicular, 12 to 14 mm. long, hairy-margined, and white hairy; the corolla is 7 to 9 cm. across; the 5 petals are nearly distinct, white, membranous, concave, obovate, 4 to 5 cm. long, somewhat crisped and rounded, silky; stamens numerous, their filaments elongated, distinct; anthers yellow, versatile; ovary 5-celled, ridged, hairy, the slender style about as long as the stamens; the stigma is disk-like. The fruit is a blunt, 5-valved, woody capsule, subglobose, 1.5 to 2 cm. in diameter, splitting upward from the bottom; the seeds, 6 to 8, or fewer in each cell, are 12 to 14 mm. long, angled, woody-coated; endosperm none.

The genus, consisting of but one known species, is named in honor of the illustrious American philosopher and statesman, Benjamin Franklin.

II. LOBLOLLY BAY

GENUS **GORDONIA** ELLISSpecies **Gordonia Lasianthus** (Linnaeus) Ellis*Hypericum Lasianthus* Linnæus

ALSO called Tan bay, this is a large evergreen tree of the southeastern States, ranging from southern Virginia to Florida and Louisiana, near the coast; it reaches a maximum height of 25 meters, with a trunk diameter of 5 dm., usually much smaller and sometimes shrubby.

The trunk is usually straight, the branches upright or spreading. The bark is 2 cm. thick, deeply fissured into ridges and splitting into small reddish brown scales. The twigs are stout, dark brown. The winter buds are sharp-pointed, 6 to 8 mm. long, and silky hairy. The leaves are thick and leathery, narrowly elliptic or oblanceolate, 5 to 15 cm. long, pointed or bluntish at the apex, narrowed at the base into a short-winged stalk, finely toothed above the middle, dark green, smooth, and shining above, dull green and smooth beneath. The flowers, opening from June to September, are large and showy, white, borne on smooth stalks 3 to 7 cm. long, in the axils of the upper leaves; they are subtended by several small, early-falling bracts; the calyx is composed of 5 unequal sepals, suborbicular, 8 to 12 mm. long, fringed and velvety; the corolla is 5 to 7 cm. across; the petals are ovate to elliptic, 2.5 to 3.5 cm. long, united and narrowed at the base, rounded at the apex and silky-hairy. The numerous stamens are on a 5-lobed, cup-shaped, fleshy disk at the base of the petals, their filaments short and distinct; anthers yellow, versatile; ovary 5-celled, ovoid; style stout, with spreading stigmas; ovules 4 in each cavity. The fruit is an ovoid capsule, 15 to 18 mm. long, sharp-pointed, silky, splitting into 5 segments, the angular central placental axis remaining. Seeds 2 to 4 in each cell, flattened and somewhat S-shaped, 6 to 7 mm. long, with a papery brown wing.



FIG. 650. — Loblolly Bay.

The numerous stamens are on a 5-lobed, cup-shaped, fleshy disk at the base of the petals, their filaments short and distinct; anthers yellow, versatile; ovary 5-celled, ovoid; style stout, with spreading stigmas; ovules 4 in each cavity. The fruit is an ovoid capsule, 15 to 18 mm. long, sharp-pointed, silky, splitting into 5 segments, the angular central placental axis remaining. Seeds 2 to 4 in each cell, flattened and somewhat S-shaped, 6 to 7 mm. long, with a papery brown wing.

The wood is soft, weak, fine-grained, and reddish; its specific gravity is about 0.47. It is occasionally used in cabinet work; its weakness, however, prevents its general application. The bark is sometimes used in tanning.

The genus comprises about 10 species, mostly Asiatic trees or shrubs; our species is the type. The name is in honor of James Gordon (1750-1780), an English nurseryman, who introduced many American plants into English gardens.

THE JUNCO FAMILY

KÆBERLINIACEÆ Engler



THIS family consists of a single genus, with but one known species, a tree or shrub occurring in northern Mexico and adjacent Texas; it is a nearly leafless, spiny branched plant, without economic interest.

This curious plant has alternate, scale-like leaves, which are broadest near the apex and very soon deciduous. The very small flowers are perfect, in short racemes near the ends of the branchlets, opening from March to June. Their calyx consists of 4, rarely only 3, distinctly imbricated, deciduous sepals ovate, blunt 1 mm. long; the corolla of an equal number of white obovate convolute petals 2.5 mm. long, which are somewhat clawed; stamens 8, shorter than the petals, their filaments distinct, and thickened at the middle; the anthers are oval, attached on the back, 2-celled, opening lengthwise; the ovary, of 2 united carpels, is ovoid, 2-celled, and stalked, the style simple, awl-shaped; stigma terminal and blunt; ovules numerous, attached to the placenta in several rows. Fruit a 2-celled globose black berry, tipped with the persistent style; flesh thin; seeds 1 to several in each cell, spirally twisted and wrinkled; endosperm thin.

JUNCO

GENUS **KÆBERLINIA** ZUCCARINI

Species ***Kæberlinia spinosa*** Zuccarini



JUNCO inhabits dry, gravelly regions bordering the Rio Grande River and some of its tributaries in Texas and adjacent Mexico, where it forms immense and formidable thickets and attains a maximum height of 8 meters, with a trunk diameter of 3 dm. The trunk is very short, scarcely 2.5 meters tall before it begins to branch into a dense head. The branches are all terminated by firm, often curved thorns, and covered with a light green bark. The bark of the trunk is thin, scaly and red-brown. The twigs are short, alternate and smooth.



FIG. 651. — Junco.

The wood is hard, close-grained, dark brown to nearly black; its specific gravity is about 1.12. The generic name is in honor of C. L. Koeberlin, a Bavarian clergyman and botanist.

Holocantha Emoryi A. Gray, a leafless, thorny plant of the Quassia family, much resembling this tree, occurs in the same region and originally described as a "curious small shrub or tree," was thought to belong to the same genus. It can be distinguished by its velvety younger twigs, different inflorescence, and by its fruit, which is closely clustered, dry, and 3-lobed.

THE PAPAYA FAMILY

CARICACEÆ Dumortier



HIS family comprises 2 genera, including about 22 species of trees or tree-like herbs, peculiar to tropical America. They are valuable on account of their juicy fruit and the digestive properties of its milky sap.

The *Caricaceæ* have large, alternate, palmately lobed, stalked leaves. The flowers are rarely perfect, usually monœcious or diœcious. The calyx is short. The staminate flowers have a gamopetalous corolla, with an elongated tube and broad 5-lobed limb; the 10 stamens are inserted in the throat of the corolla in 2 series, one shorter than the other; anthers adnate to the filaments, 2-celled and introrse. The pistillate flowers have a polypetalous corolla of 5 erect petals, mostly spreading above the middle; there are no stamens nor staminodes; the ovary of 5 carpels is free, sessile, 1-celled, or appearing as if 5-celled, without a style, the 5 distinct stigmas being sessile; ovules many, in 2 rows. The perfect flowers have a shorter corolla, otherwise similar to the pistillate flowers and without staminodes. The fruit is a large juicy berry, with numerous rough seeds, their endosperm fleshy. One species enters the extreme southern portion of our area.

PAPAYA

GENUS **CARICA** LINNÆUS

Species **Carica Papaya** Linnæus



ALSO called Custard apple, and Papaw, this peculiar plant is of short duration, and its stem structure and lack of branches suggest a gigantic herb. It is a common plant throughout tropical America and occurs in our area in southern Florida, where improved varieties are cultivated for their fruit. Its maximum height is about 6 meters, with a trunk diameter of 1.5 dm.

The trunk is slender, round, and naked, seldom branched. The bark is thin, light green; it gradually passes into the woody tissue, which is very soft and porous and only about 2 cm. thick, enclosing a layer of pithy tissue which in turn encloses a large central cavity. The leaves, borne at the top of the trunk, are suborbicular in outline, 2 to 6 dm. broad, palmately 5- to 7-lobed, the segments again pinnately lobed and pointed, light green above, pale and glaucous with prominent yellowish venation beneath; the leaf-stalk is yellow, stout, hollow, often 5 dm. long



FIG. 652. — Papaya, Florida.

and enlarged at the base. The yellow flowers appear at any season; usually the different kinds are on separate trees, seldom on the same tree; the staminate are in slender panicles 1 to 3 dm. long, and fragrant; the calyx is 1 to 1.5 mm. long; the corolla is salverform, 2.3 to 3 cm. long, the tube slender, dilated near the top, the lobes lanceolate or oblong-lanceolate, scarcely as long as the tube; rudimentary ovary, if present, short, awl-shaped. The pistillate flowers are in 1-to 3-flowered short-stalked cymes; the calyx is 3 to 6 mm. high, persistent; corolla of distinct

linear-lanceolate, erect petals 2 to 2.5 cm. long, twisted in the bud; the ovary is ovoid, bluntly 5-angled. The perfect flowers have a tubular-bellshaped, corolla, its lobes erect, and usually 5 stamens; ovary obovoid or oblong. The fruit is a large berry, oblong to subglobose, 2 to 12 cm. long, short-pointed at the apex, yellowish or orange-colored, the skin thick, closely adhering to the firm flesh, sweetly insipid, enclosing a mass of numerous black, round, rough seeds each about 4 mm. long.

It is largely cultivated in the tropics for its fruit, improved forms yielding very large sweet kinds. In Florida two varieties are growing wild, one with slender green stems, producing small fruit, the other has stout, purplish stems, and yields a large fruit.



FIG. 653. — Papaya.

The Papaya is useful in many ways; various parts of the plant have been used medicinally for many human ailments. The juice will remove warts and cleanse wounds. The leaves are used as soap and tough meat is packed in them to make it tender. The active principle, an enzyme of the milky juice, papain, is a grayish white powder, which has been used in scientific medicine as a digestive agent similar to pepsin, and to dissolve the membranes in diphtheria.

The genus consists of about 21 species, all tropical American plants very similar to the Papaya, which is the type of the genus. The name Papaya is the old Carib one; the generic name refers to the supposed resemblance of the fruit to figs.

The wood is soft and spongy and of no known use.

THE CACTUS FAMILY

CACTACEÆ Lindley



OME cactuses have been regarded as trees by various authors, but it seems best to us to exclude them all from the category. The stem-structure of big and little ones is very similar, and no criterion, except that of size, is available to determine which to include and which to regard as shrubs or herbs. They form a natural group not readily divisible into herbs, shrubs, and trees, and are very numerous in the arid regions of temperate and tropical America.

Four species, natives of the south central and southwestern United States, have been described as trees. The largest of these is the columnar Suwarro, *Cereus giganteus* Engelmann, of Arizona, southeastern California, and Sonora, which sometimes reaches a height of 20 meters, with a trunk up to 6 dm. in diameter, either simple or with several upright branches; the stem and branches are longitudinally ribbed and the ribs bear very numerous clusters of stout spines 2 to 4 cm. long. The white flowers are about 1 dm. long and 6 cm. wide, crowded near the top of the stem. The pulpy fruit is ovoid, red, edible, and about 6 cm. long.

Three large species of the genus *Opuntia* inhabit the same general region. These are much branched very prickly plants, the prickles accompanied by minute barbed bristles. All three species have round knobbed stems and branches and attain a maximum height of only about 4 meters. Their flowers are pink, purple, red or yellow, the corolla rotate.

THE POMEGRANATE FAMILY

PUNICACEÆ Horaninow



PUNICACEÆ consist of but 1 genus, with 1 or possibly 2 species of small trees or shrubs with opposite branches, native of Persia and adjacent countries.

Plants of the Pomegranate Family have opposite or clustered leathery leaves. The perfect flowers are large and showy, on stout peduncles, solitary, or in clusters of 2 to 5 in the axils of the leaves. The calyx is joined to the ovary, 5- to 7-lobed, and leathery. The corolla consists of 5 to 7 petals inserted in the throat of the calyx-tube; the stamens are numerous, in several series, inserted with the petals; filaments stout, the anthers ovate, attached at the middle; the pistil consists of several united carpels; ovary several-celled, inferior, the styles united, the stigmas somewhat lobed; the ovules are numerous, superimposed, in 2 series. The fruit is a several-celled, hard-shelled, leathery berry, capped with the enlarged calyx; its septa are membranous; the seeds are numerous, more or less angular, in a watery pulp, their coating leathery; the embryo has spirally convolute auricled cotyledons.

POMEGRANATE

GENUS **PUNICA** [TOURNEFORT] LINNÆUS

Species **Punica Granatum** Linnæus



SMALL tree, cultivated in all warm temperate countries for its fine fruit as well as for ornament. It is frequently naturalized in regions where it has long been cultivated, and is so found in peninsular Florida, where it occurs in sandy woods and waste places. It is a much-branched small tree or shrub, reaching a height of 6 meters, and is also known as the Punic apple or Garnet apple.

The bark is very thin, about 1 mm. thick, brownish gray, very shallowly reticulated, yellowish within; the twigs are slender, angular, becoming round, gray to brown. The leaves are entire, leathery, elliptic, oblong or oblanceolate, 1 to 6 cm. long, blunt or pointed, rarely notched, tapering at the short-stalked base, light green and prominently veined. The flowers are solitary or in clusters; the calyx-tube is bell-shaped, its lobes thick, leathery, triangular or triangular-lanceolate, sharp-pointed; the petals are obovate to nearly orbicular, short-clawed, 1.5 to 2.5 cm. long, bright scarlet. The fruit, ripening in September, is globular or nearly

so, 5 to 10 cm. in diameter, of a yellowish to garnet red color; the watery pulp is reddish and agreeably acidulous.

The wood is hard, close-grained, light yellow; its specific gravity is about 0.93. It has been used as a substitute for Boxwood, *Buxus sempervirens* Linnæus, by wood engravers.



FIG. 654. — Pomegranate.

As an economic plant it is of considerable importance. The fruit is especially valuable in hot, dry regions. The rind of the fruit and the bark of both stem and roots are vermifuge and tæniifuge; its active constituent, pelletierine, is a specific for the removal of tapeworm.

The generic name is Latin, derived from the Roman name for Carthage, whence this fruit was obtained.

THE MANGROVE FAMILY

RHIZOPHORACEÆ Lindley



HIS family consists of about 15 genera, with some 50 species of trees or shrubs, many of maritime habitat, confined to the tropical and subtropical regions of both hemispheres, probably most abundant in the Old World. The wood of the larger growing trees of this family is of some importance in marine construction on account of its durability in salt water, and the astringent bark of some of them is valued for tanning; their chief economic value, however, is in the habit of growth, which causes some of them to protect land from the encroachments of the sea.

Plants of the Mangrove family have an astringent bark and round twigs; their leaves are usually opposite, smooth, thick and leathery, stalked and stipulate. The flowers are regular and perfect, solitary or variously clustered in the axils of the leaves; the calyx is persistent, 3- or 4-lobed; corolla usually inconspicuous, its petals of the same number as the divisions of the calyx; stamens two to four times the number of petals, seldom only as many, inserted at the base of a more or less conspicuous disk, their filaments long or short, the 2-celled anthers opening lengthwise; pistil of 2 to 5 united carpels, the ovary 1- to 5-celled, the styles short, united, the stigma various, entire or lobed; ovules pendulous, 2, 4, or rarely more in each cavity. The fruit is berry-like and leathery, capped with the persistent calyx, indehiscent or tardily splitting. The seeds are various.

There is but one species in our area.

MANGROVE

GENUS **RHIZOPHORA** LINNÆUS

Species **Rhizophora Mangle** Linnæus



SOMETIMES also called the Red mangrove, this tree is a characteristic inhabitant of low, muddy shores, tidelands, and marshes of tropical America, entering our area in southern Florida, where it forms large dense thickets bordering the shores. It is said to attain its greatest perfection in the streams flowing from the Everglades. Its maximum height is about 25 meters, with a trunk diameter of 1.2 meters or more.

The bark is about 12 mm. thick, shallowly furrowed into broad ridges and scaly plates, brownish gray; internally it is red. The twigs are smooth, very stout and pithy. The leaves are opposite, persistent, thick, leathery, elliptic to obovate, 5 to 15 cm. long, bluntly pointed, tapering at the base into a stout stalk, entire-

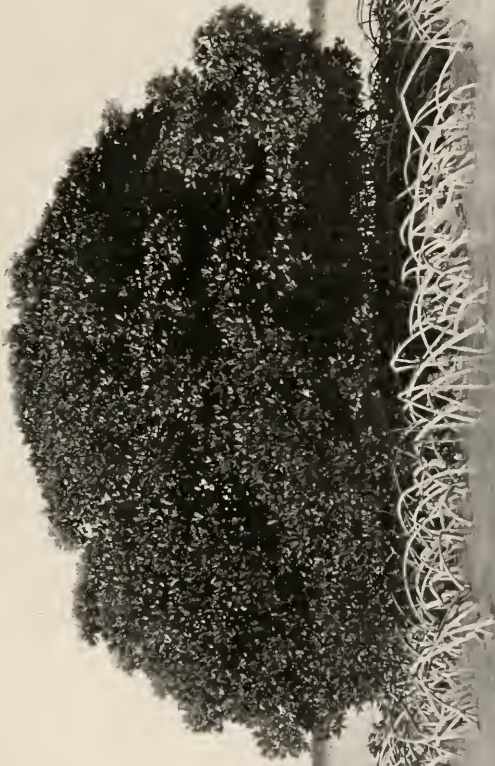


FIG. 655. — Mangrove, Florida.

margined, dark green, smooth and shining above, paler with prominent midrib beneath; the elongated stipules are deciduous. The axillary peduncles are 1 to 4 cm. long, bearing 2 or 3 pediceled flowers; the calyx is sharply 4-lobed and leathery; petals yellowish white, linear or nearly so, long hairy; stamens 8, in 2 sets, with short filaments; ovary partly inferior, conic, 2-celled, with 2 awl-shaped styles with stigmatic tips. The berry is conic, leathery, 2 to 2.5 cm. long, rough, brown, subtended by the persistent, reflexed calyx-lobes; the seed, usually solitary, germinates in the fruit while this is still attached to the tree, its radicle forcing its way out and growing downward, suspended from the fruit, often until it becomes 2.5 to 3 dm. long before falling off and taking root in the mud, soon forming a new plant; these with the arching aerial roots that develop from the trunk and branches

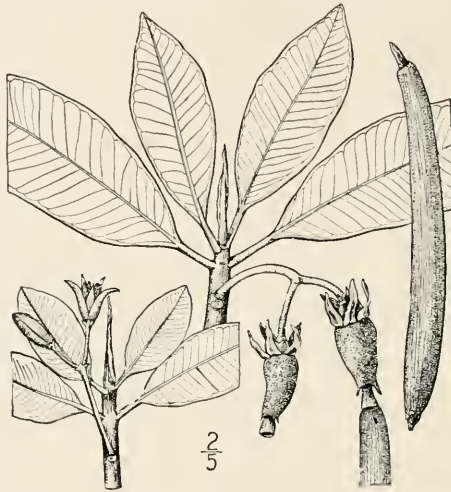


FIG. 656. — Mangrove.

of the older plants form a network, which not only prevents the trees from being washed away by the waves, but affords a place of lodgment for all sorts of debris, the constant accumulation of which in time raises the ground above the surface of the water, thus increasing the land and literally making "islands grow."

The wood is hard, close-grained, strong, dark red-brown and satiny; its specific gravity about 1.16. It is used for fuel, and for wharfs and docks, not being bored by the marine worm-like mollusk *Teredo*. The astringent bark is used for tanning leather.

The name is Greek, in reference to the aerial roots borne on its branches.

There are 2 other species known from the coasts of tropical Africa, the East Indies, and Australia, their habits being very similar to the American tree, which is the type species.

THE WHITE MANGROVE FAMILY

COMBRETACEÆ R. Brown



HIS family comprises some 15 genera, containing about 285 species of trees, shrubs or vines. They inhabit all the tropical regions, but are most numerous in the eastern hemisphere. Many of them are plants of the seacoast; they are of no especial economic value, except that the wood of the larger trees is used for construction and fuel. The astringent bark and fruits of some are used for dyeing and tanning.

Plants of the White mangrove family have alternate or opposite simple, leathery leaves, with petioles that are often glandular at the base, and without stipules. The flowers are perfect or polygamous, regular, clustered in heads, spikes or racemes; the calyx is 4- or 5-lobed, deciduous, or persistent; the petals are of the same number as the calyx-lobes, or sometimes entirely wanting; stamens as many or twice as many as the petals, rarely more, their filaments distinct, anthers facing inward; pistil mostly of 1 carpel, the ovary 1-celled with 2 to 5 suspended ovules; style terminal; stigma entire or nearly so. The fruit is a drupe or berry, indehiscent, sometimes crowned with the enlarged persistent calyx; seeds solitary and filling the cavity; there is no endosperm; the embryo is straight, its cotyledons convolute. Our genera are:

Calyx deciduous; petals wanting.

Flowers spicate; fruit large, almond-like.

Flowers capitale; fruit small, cone-like.

Calyx persistent; flowers spicate; fruit small.

Petals wanting; leaves alternate.

Petals present; leaves opposite.

1. *Terminalia*.

2. *Conocarpus*.

3. *Bucida*.

4. *Laguncularia*.

I. INDIAN ALMOND

GENUS **TERMINALIA** LINNÆUS

Species **Terminalia Catappa** Linnæus



LARGE tree with very large leaves and whorled, outspreading branches, native of the East Indies. It is widely planted in tropical countries for shade and is variously known as Catappa, Olive bark tree, Malabar tree, Almond tree, Demerara almond, and West Indian almond. It has become naturalized in America as far north as peninsular Florida. Its maximum height is about 24 meters, with a trunk diameter up to 1.5 meters.

The twigs are very stout and pithy, dark gray and marked with numerous



FIG. 657. — Indian Almond, Aguadilla, P. R.

leaf scars. The leaves are alternate, entire-margined, crowded at the ends of the branchlets, thick and leathery, obovate, wedge-shaped at the base, 1 to 3 dm. long, rounded, often abruptly tipped at the apex, short stalked, dark green and shining above, paler beneath. The small flowers are perfect or polygamous, greenish white, in slender spikes 5 to 15 cm. long, the staminate flowers toward the top, the pistillate at the base of the spikes; the calyx is hairy, its lobes ovate or triangular, about as long as the tube; corolla none; stamens 10 to 20 in 2 series, exserted, the anthers heart-shaped; style single, ending in a stigmatic tip. The fruit is a woody drupe, somewhat ellipsoid, compressed, 2-edged or slightly winged, short pointed, 4 to 7 cm. long; the seed is cylindric-ellipsoid, 3 to 4 cm. long, 6 to 10 mm. in diameter, and is edible.

The wood is hard, close-grained, red-brown, with a specific gravity of about 0.70. The ripe seeds are used, especially in the West Indies, like almonds, but the flavor is more like that of the filbert; a fixed oil is also expressed from them. The unripe fruits of this and other trees of the genus are highly astringent and are used in tanning and dyeing; they are exported from the East Indies into England under the name myrobalans. All parts of the plant are more or less astringent and tonic and have been used in tropical medicine.

Terminalia is a large genus, about 100 species having been described, mostly natives of the eastern tropics. *T. Catappa* is the type of the genus. The name is Latin, with reference to the clustering of the leaves at the ends of the branches.



FIG. 658. — Indian Almond.

II. BUTTONWOOD

GENUS **CONOCARPUS** LINNÆUS

Species **Conocarpus erecta** Linnaeus



CONOCARPUS attains all manner of forms, from that of a prostrate shrub, less than a meter high, to that of an upright tree 20 meters tall, with a trunk diameter of 7 or 8 dm. It occurs on tropical sea-coasts, either muddy, sandy, or rocky, often where exposed to spray. It is known from the coasts of peninsular Florida and the Keys, throughout the West Indies and tropical America, and is also reported from Africa.

The bark is broken by a network of fissures into irregular flat ridges and thin scales of a dark brown color. The twigs are slender, angular, or sometimes winged, smooth and shining or finely hairy, green, becoming round and gray or brown. The leaves are alternate, persistent, leathery, elliptic to oval or obovate,

2 to 10 cm. long, mostly sharp or taper-pointed at both ends, entire on the margin, light green and smooth above, paler and sometimes hairy, with prominent



FIG. 659. — Buttonwood.

yellowish midrib beneath; the leaf-stalk is stout and broad, 5 to 15 mm. long, with 2 glands at the top. The flowers, appearing at all seasons, are perfect, very small and green, in panicles of dense globular heads 10 mm. in diameter, on stout, hairy stalks; the calyx-tube is funnel-shaped, about 1 mm. long, its lobes triangular-ovate, about as long as the tube, and hairy; corolla none; stamens usually 5, sometimes 7 or 8, their exerted filaments elongated, anthers heart-shaped; ovary inferior, 1-celled, 2-ovuled, style slender,

hairy at the base and terminated by a stigmatic tip. The fruit is a globular or oval cone-like aggregation of small, flat, winged, scale-like drupes, purplish green, about 10 mm. in diameter; the seed is flattened and brown, without endosperm.

The wood is hard, strong, close-grained, grayish to yellowish brown, and about the weight of water, its specific gravity being a trifle under 1.00. Its chief value is for fuel and charcoal. The astringent bark is used to some extent for tanning, and in tropical medicine.

The genus is usually considered monotypic, but the plant described as *Conocarpus sericea* Forster, which has densely white-silky foliage, appears distinct; it grows with the typical form in Florida and the West Indies, usually shrubby. The name is Greek, in reference to the cone-like fruit.

III. BLACK OLIVE TREE

GENUS **BUCIDA** LINNÆUS

Species **Bucida Buceras** Linnæus

Terminalia Buceras C. Wright



THIS tree just enters our area by occurring on Elliott's Key, in southern Florida, but is widely distributed in the West Indies and in Central America, reaching a maximum height of about 25 meters, with a trunk diameter of 9 dm. or more.

The crooked branches are stout, spreading, the tree round-topped. The bark is up to 2 cm. thick, scaly, gray. The twigs are round, regularly forked and hairy, but become zigzag, quite smooth and light brown or gray, often with spines 2 to

3 cm. long. The buds are naked. The leaves are alternate, usually crowded at the ends of the branches, thick and leathery, obovate to spatulate or elliptic, 3 to 9 cm. long, entire, blunt or slightly notched, often minutely tipped, gradually tapering to the short petiole, bright green above, yellowish green beneath, hairy at first, becoming smooth, except along the stout midrib beneath. The perfect small green flowers appear in spring, in slender, hairy spikes 3 to 10 cm. long; the calyx-tube is saucer-shaped, hairy, 3 mm. high, its lobes broadly triangular, sharp-pointed; corolla none; stamens 10, conspicuously exserted, their anthers arrow-shaped; style slender, hairy at the base. The fruit is a drupe, ovoid-conic, 7 to 8 mm. long, often slightly curved, capped by the enlarged persistent calyx, thinly hairy; the seed is ovoid, sharp-pointed.



FIG. 660. — Black Olive Tree.

The wood of the Black olive tree is hard, close-grained, and yellowish brown, is valued for construction and makes excellent fuel. Its specific gravity



FIG. 661. — Black Olive Tree, Inagua, Bahamas.

is about 1.04. The bark is astringent and has been used in the West Indies for tanning.

The generic name is Greek, based on the statement of Patrick Browne that in Jamaica "on the flower spikes of this tree you may sometimes find fructifications something in the form of a bull's horn." There is but one species known.

IV. WHITE MANGROVE

GENUS **LAGUNCULARIA** C. F. GÆRTNER

Species **Laguncularia racemosa** (Linnaeus) C. F. Gærtner

Conocarpus racemosus Linnaeus



THE White mangrove, also called White buttonwood, is common on the seashores of the West Indies, Mexico, and Central America, and is also reported from western Africa. It enters our territory in peninsular Florida and some of the Keys, where it is commonly only a shrub, but attains a maximum height of about 20 meters, with a trunk diameter of 8 dm.



FIG. 662. — White Mangrove.

The branches are stout and short, forming an oblong round tree. The bark is about 6 mm. thick, fissured into long reddish brown scales. The twigs are round or slightly angular, dark reddish brown and smooth, thickened at the nodes. The leaves are opposite, thick and leathery, oblong to oval or obovate, entire-margined, 2 to 7 cm. long, rounded or notched at the apex, rounded, narrowed, or slightly heart-shaped at the base, dull green and smooth above, paler beneath, the leaf-stalk stout, 5 to 20 mm. long, with 2 glands. The flowers are perfect or polygamous, in few-flowered clustered spikes 3 to 6 cm. long, with small hairy bractlets; the persistent calyx is 5-lobed, the lobes semiorbicular, sharp-pointed; petals 5, nearly orbicular, not longer than the calyx; stamens 10; filaments awl-shaped, the anthers heart-shaped; ovary 1-celled, style short, terminated by a somewhat 2-lobed stigma. The fruit is a leathery, 10-ribbed, obovoid to oblong, reddish drupe about 15 mm. long.

The wood is hard, strong, dense and yellowish brown; its specific gravity is about 0.86. The astringent bark is sometimes used for tanning, and in medicine.

The genus is monotypic, but one species being known. Its name is Latin, from the fancied resemblance of the fruit to a flask.

THE MYRTLE FAMILY

MYRTACEÆ R. Brown



HIS family consists of about 75 genera, comprising some 2700 species of trees and shrubs, nearly all natives of warmer temperate regions and of the tropics, where they especially abound. They are of considerable economic importance, especially in the southern hemisphere, where the Australian genus, *Eucalyptus*, is of the greatest value for timber and otherwise. Several edible fruits are produced by species of various genera, especially *Psidium* and *Eugenia*; the important spices; Cloves, and Pimenta or Allspice, are also products of this family.

The *Myrtaceæ* have mostly opposite leaves, although in some genera they are alternate or whorled, usually pinnately veined, pellucid-punctate and abounding in oil glands; there are no stipules. The flowers are regular and perfect, variously clustered, the calyx-lobes 4 or 5 or more, valvate or imbricated, persistent, or cap-like and deciduous; the 4 or 5 petals are inserted on the margin of the disk or wanting; the stamens are numerous, rarely as few as the calyx-lobes, their filaments distinct or partly united near the base; anthers opening lengthwise; the ovary is inferior or partly so, and 1- to several-celled; the style is terminal, rarely lateral, and usually terminated by an entire stigma; ovules 1 or many. The fruit is mostly indehiscent, often fleshy, usually crowned with the persistent calyx; the seed is straight, round or angled, the coating papery or crustaceous; there is no endosperm. Our arborescent genera are:

Petals present; calyx-lobes persistent.

Calyx-lobes separating regularly.

Inflorescence centripetal, racemose or umbellate, or contracted.

Inflorescence centrifugal, cymose.

Calyx-lobes separating irregularly.

Petals absent; calyx-lobes coming off like a cap.

American trees; seeds 1 or 2.

Introduced from Australia; seeds many.

1. *Eugenia*.

2. *Ananomis*.

3. *Psidium*.

4. *Calyptanthus*.

5. *Eucalyptus*.

I. THE STOPPERS

GENUS **EUGENIA** [MICHELI] LINNÆUS



EUGENIA comprises some 600 species of tropical evergreen aromatic trees or shrubs, common in America and Asia, less abundant in Africa. Some of their fruits are large and edible; the bark and leaves of some are medicinal; the fruits and flowers of others are used as spices, and the fruit of the typical species, *Eugenia uniflora* Linnæus, the Surinam cherry, is edible.

They have opposite, usually leathery, feather-veined entire leaves, without stipules. The inflorescence is centripetal, the flowers variously clustered, or solitary, with small bracts and bractlets. The calyx-tube is globose to top-shaped, the lobes 4 or 5; the petals are inserted on the margin of the disk, usually 4, rarely 5, spreading; stamens many, their filaments thread-like, separate, in several rows, or slightly united at the base into 4 groups, the anthers versatile; ovary sessile, 2- to 3-celled, with several ovules in each cell; style simple and thread-like, terminated by a stigmatic tip. The fruit a pulpy, dryish, or leathery berry, capped by the persistent calyx; seeds 1 to 4, globose or variously flattened.

The name is in honor of Prince Eugene of Savoy (1663-1736), an Austrian general and patron of botany and horticulture.

The species that are known to occur in our area all become arborescent.

Flowers in short racemes.

Leaves oblong to cuneate-obovate; fruit longer than broad.

Leaves ovate to elliptic; fruit broader than long.

Flowers solitary or umbellate.

Peduncles shorter than the leaves.

Leaves acute or subacuminate; fruit thicker than long.

Leaves abruptly acuminate; fruit about as long as thick.

Peduncles longer than the leaves.

1. *E. buxifolia*.

2. *E. axillaris*.

3. *E. rhombea*.

4. *E. confusa*.

5. *E. longipes*.

1. SPANISH STOPPER — *Eugenia buxifolia* (Swartz) Willdenow

Myrtus buxifolia Swartz. *Myrtus axillaris* Poirét, not Swartz

Also called Gurgeon stopper; this small tree or shrub of the West Indies enters our area in southern peninsular Florida and the Keys, where it grows in sandy or rocky soil and attains a height of 6 meters, with a trunk diameter of 3 dm.



FIG. 663. — Spanish Stopper.

The bark is about 3 mm. thick, light reddish brown, and scaly. The twigs are round, slender, with reddish hairs, soon becoming smooth, gray or reddish gray. The leaves are leathery, oblong to obovate, 2 to 3 cm. long, blunt at the apex, tapering at the base to the short petiole, entire on the revolute margin, deep green

above, yellowish green and black dotted beneath. The flowers expand at nearly

all seasons, in small short axillary or lateral racemes, on rusty-hairy pedicels. The 4 calyx-lobes are blunt; the corolla is 3 or 4 mm. across, its 4 white petals glandular-punctate and fringed on the margin. The fruit is oval or subglobose, somewhat oblique, 5 to 8 mm. long, black, and aromatic.

The wood is very hard, strong, close-grained, and dark reddish brown; its specific gravity is 0.94, and it is used for fuel on the Florida Keys.

2. WHITE STOPPER — *Eugenia axillaris* (Swartz) Willdenow

Myrtus axillaris Swartz. *Eugenia monticola* Grisebach, not Willdenow

This small, slow-growing tree or shrub occurs in sandy or rocky soil in peninsular Florida and the Keys, and is widely distributed in the West Indian islands, north to Bermuda, reaching a maximum height of 8 meters, with a trunk diameter of 3 dm.

The bark is about 3 mm. thick, irregularly and shallowly fissured and broken into small thin plates of a light brown color. The twigs are rather stout, round and stiff, gray or reddish gray. The leaves are thick and leathery, elliptic-ovate or nearly elliptic, broadest just below the middle, 3 to 7 cm. long, narrowed at the apex into a bluntish tip, tapering at the base to the broad petiole, entire and revolute on the margin, dark green with a broad impressed midrib above, paler, minutely dotted and with elevated veins beneath. The flowers, opening in summer and autumn, are in short axillary clusters, on stout smooth or hairy pedicels. The

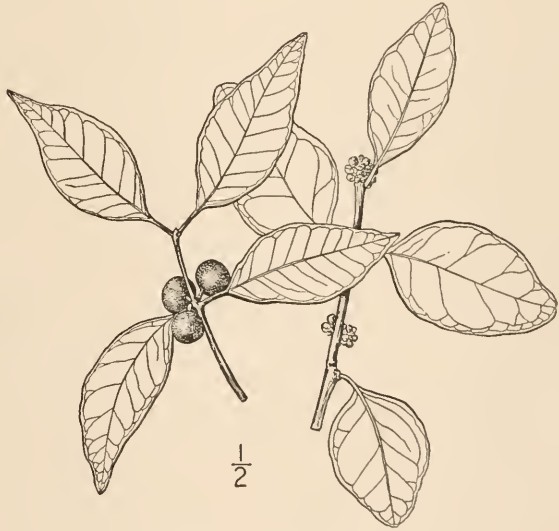


FIG. 664. — White Stopper.

calyx is punctate, its lobes rounded; corolla 3 to 4 mm. across, its petals larger than the calyx-lobes, the many white stamens conspicuous. The fruit is a depressed globular, glandular-punctate berry, 10 to 12 mm. in diameter and crowned with the persistent calyx-lobes, its flesh sweet, pleasant to the taste and aromatic; it usually contains but one globose brown seed.

The wood is hard, strong, close-grained and brown or reddish brown; its specific gravity is about 0.91. The foliage is unpleasantly scented, the odor distinctly mephitic, and very noticeable to leeward.

3. RED STOPPER — *Eugenia rhombea* (Berg) Krug and Urban*Eugenia procera* Nuttall, not Poiret. *E. jætida rhombea* Berg

This small West Indian tree is only known to occur in our area on several of the Florida Keys, but is abundant in the West Indies, attaining a maximum height of 8 meters, with a trunk diameter of 3 dm. It is also called Spiceberry.

The bark is about 1.5 mm. thick, close and smooth, light gray or reddish gray.



FIG. 665. — Red Stopper.

The twigs are slender, round, purplish or reddish, becoming gray or white. The leaves are firm, scarcely leathery, ovate to elliptic, 3 to 6 cm. long, bluntly taper-pointed, rounded or gradually tapering to the short petiole, thickened on the margin, bright green, dull and smooth above, paler and black-dotted beneath. The flowers, appearing from spring to autumn, are in small umbel-like clusters, each on a slender pedicel 8 to 15 mm. long. The calyx-tube is shorter than its 4 rounded lobes; corolla white, its broadly ovate petals

twice the length of the calyx-lobes. The fruit is depressed-globose, 16 to 22 mm. in diameter, slightly glandular, conspicuously crowned by the persistent calyx-lobes, orange, reddish or black when ripe; the flesh is thin and dry; seed nearly globular, brown, and shining.

This is one of the most beautiful trees of Florida when laden with fruit.

4. GARBER'S STOPPER — *Eugenia confusa* de Candolle*Eugenia Garberi* Sargent

Garber's stopper is by far the largest native tree of its family, in our area. It grows in hammocks in southern peninsular Florida and the Keys, also in the Bahamas and Porto Rico and Jamaica; its maximum height is about 18 meters, with a trunk diameter of 5 dm. It is also known as Red stopper.

The branches are spreading and ascending, forming a dense tree. The bark is about 5 mm. thick, separating into many thin scales of a brownish red color. The twigs are slender, round, smooth and gray. The leaves are ovate, oval-ovate or oblong-ovate, 3 to 7 cm. long, conspicuously taper-pointed, rounded or tapering at the base, entire, revolute on the margin, dark green and shining above, paler,

black dotted beneath; the rather stout leaf-stalk is 2 to 6 mm. long. The flowers are 6 to 8 mm. wide and appear at nearly all seasons, in several flowered, axillary clusters, on smooth pedicels 6 to 15 mm. long; the calyx is punctate, its 4 lobes ovate and sharp-pointed; corolla white, its blunt petals ovate. The fruit, which is solitary, or 2 to 4 together, is subglobose, scarlet, 5 to 8 mm. in diameter, glandular and capped by the calyx-lobes; its flesh is thin and dryish; seed nearly globular, light brown and shining.



FIG. 666. — Garber's Stopper.

The wood is very hard, strong, close-grained, and reddish brown; its specific gravity is about 0.94. The dark green lustrous foliage is very striking, the leaves characteristically drooping.

5. LONG STALKED STOPPER — *Eugenia longipes* Berg

Although usually a low shrub, this rarely becomes a small tree up to 4 meters high, with a trunk 1 dm. in diameter. It grows in sandy or rocky soil in southern Florida and the Bahama islands.



FIG. 667. — Long Stalked Stopper.

The twigs are slender, slightly hairy, reddish brown to gray. The leaves are thick and leathery, oblong to oval, 1 to 3 cm. long, sharp or blunt-pointed, narrowed or rounded at the base, entire and revolute on the margin, bright green, smooth and shining, with prominent yellowish midrib above, slightly paler, finely netted and black dotted beneath, the leaf-stalk stout and short. The flowers are in axillary, few-flowered clusters on pedicels 2 to 6 cm. long; calyx smooth but glandular punctate, its 4 lobes ovate to broadly ovate; the corolla is white, 8 to 10 mm. broad, its petals oblong, much longer than the lobes of the calyx. The fruit is a subglobose, dark red berry, 6 to 9 mm. in diameter, crowned

with the very large persistent calyx-lobes.

II. NAKED STOPPER

GENUS **ANAMOMIS** GRISEBACHSpecies **Anamomis dicrana** (Berg) Britton*Eugenia dicrana* Berg. *Anamomis dichotoma* Sargent,not *Myrtus dichotoma* Poiret

THIS evergreen tree is also known as Nakedwood. It is a low, aromatic tree or shrub of sandy or rocky soil of peninsular Florida, and the Keys, attaining a maximum height of 8 meters, with a trunk diameter of 1.5 dm.

The bark is about 3 mm. thick, close, peeling off in thin scales of a red or reddish brown color. The twigs are round and slender, hairy and reddish at first, soon becoming smooth and brown.



FIG. 668. — Naked Stopper.

The leaves are opposite, quite leathery, oblong or obovate, 2 to 4 cm. long, blunt or rarely sharp-pointed, tapering at the wedge-shaped base to the short petiole, entire, revolute and somewhat thickened on the margin, hairy when unfolding, soon becoming smooth and bright green, with small dark dots and impressed midrib above, paler and punctate beneath. The flowers appear in spring in the leaf-axils, in hairy peduncled cymes of usually 3 flowers, the terminal flower sessile, the 2 to 6 lateral flowers on pedicels 5 to 12 mm. long; the flowers are about 8 mm. across, perfect, white; the calyx obovoid, hairy, its 4 lobes ovate and rounded; petals inserted under the thick disk, about twice the length of the calyx-lobes, ovate and glandular; stamens inserted with the petals, numerous, their filaments thread-like; anthers versatile; ovary mostly 4-celled; ovules numerous; style filiform, exserted. The fruit is berry-like, oval or subglobose, 6 to 7 mm. long, red, the calyx-lobes persistent; the flesh is thin and dryish; seed usually 1, rarely 2, kidney-shaped, brown.

The wood is hard, close-grained, light brown or reddish; its specific gravity is about 0.90.

The genus is a West Indian one, containing in all about 5 species of woody plants of probably no economic value, although it is stated that an edible fruit is

produced by a Haytian species. The name is Greek, in reference to the aromatic foliage and fruits. The type is *Ananomis fragrans* (Swartz) Grisebach, native of Jamaica.

III. GUAVA

GENUS *PSIDIUM* LINNÆUS

Species *Psidium Guajava* Linnæus



THIS tropical American species has escaped from cultivation in peninsular Florida and southern California, where it occurs as a small tree or shrub, in fields and thickets, reaching a maximum height of 5 meters, with a trunk diameter of 1.5 dm. It is sometimes called Lemon guava, and is the type of the genus.

The bark is 1.5 mm. thick, close, smooth, and red-brown to gray. The twigs are 4-angled and hairy. The leaves are quite persistent, opposite, firm in texture, usually oblong, 4 to 8 cm. long, blunt or pointed, rounded or subcordate at the base, entire-margined; they are dark green and quite smooth above, more or less hairy and prominently veined beneath; the leaf-stalk is short. The large flowers, appearing in early spring and irregularly during the summer, are white, solitary in the axils; their 4 or 5 calyx-lobes separate irregularly from each other, and are 1 to 1.5 cm. long. The corolla consists of 4 or 5 petals 1.5 to 2 cm. long; stamens numerous, white, the anthers small; ovary inferior, 2- to 5-celled; style filiform, longer than the stamens; stigma capitate; ovules many in each cell. The fruit is a globular or pear-shaped, leathery-skinned berry, yellow or pinkish, 3 to 6 cm. in diameter with an aromatic, slightly acidulous pulp, and many small hard seeds imbedded therein.



FIG. 669. — Guava.

The wood is hard, strong and elastic, close-grained and brownish or reddish gray; its specific gravity is about 0.69. It is used in the tropics in small amounts for agricultural implements, tool-handles, and in carpentry. The fruit is largely used in the manufacture of jelly and preserves, Guava jelly and Guava paste being great favorites; the raw fruit, however, is rather insipid.

The genus consists of about 130 species of trees or shrubs of tropical America. The name is Greek, in reference to the edible fruit of the typical species.

IV. SPICEWOOD

GENUS *CALYPTRANTHES* SWARTZSpecies *Calyptranthes pallens* (Poirot) Grisebach*Eugenia pallens* Poirot. *Calyptranthes Chytraculia* West, not Swartz

HIS tropical tree or shrub, enters our area in southern peninsular Florida and the Keys, where it occurs in hammocks near the coast. It is common on many of the West Indian islands, attaining a maximum height of 8 meters, with a trunk diameter of about 1 dm. and has been confused with the similar *Calyptranthes Chytraculia* (Linnæus) Swartz, of Jamaica and Cuba, the type of the genus.

The trunk is slender, its rather crooked branches short. The bark is about



FIG. 670. — Spicewood.

3 mm. thick, close, smooth or sometimes scaly, light gray or nearly white. The twigs are slender, angular, and finely hairy, becoming round, quite smooth, and gray. The leaves are opposite, entire, elliptic to oblong, 3 to 8 cm. long, taper-pointed at each end, the margin slightly thickened and revolute; they are hairy at first, becoming dark green, smooth, shining and with impressed midrib above, paler, finely hairy or smooth, and punctate beneath; the leaf-stalk is 5 to 10 mm. long. The flowers are numerous in hairy panicles 5 to 10 cm. long and about as broad, the flowers sessile, about 3 mm. across; the calyx is hairy, its lobes united and separating from

the tube in a lid-like cap; there is no corolla; the numerous stamens are inserted in several series on the margin of the disk, their filaments thread-like and extending far beyond the calyx-tube, their anthers versatile, introrse, and opening lengthwise; ovary inferior, 2- or 3-celled; style filiform, simple, and terminated by a stigmatic tip; ovules 2 or 3 in each cavity. The fruit is berry-like, subglobular or oval, 5 to 7 mm. in diameter, reddish brown, the flesh thin and dry; seed mostly solitary, shining.

The wood is hard, close-grained, brown or reddish brown; its specific gravity is about 0.90.

The genus is tropical American, with about 75 species, all trees or shrubs; they are permeated by aromatic and astringent principles, on account of which the flowers, buds or fruits of some are used as spices, similar to Cloves and Pimento.

The name is Greek, in reference to the lid-like cap of the calyx. *Chytraculia* Patrick Browne, is the oldest name of this genus, but no type species was assigned to it by him.

V. EUCALYPTUS

GENUS **EUCALYPTUS** L'HÉRITIER

Species **Eucalyptus globulus** Labillardière



EUCALYPTUS, also called Blue gum, was introduced into California about 1870; on account of its rapid growth it has been very extensively planted for timber and for shade, and has become spontaneous in some localities, promising to spread. In its native country it reaches a height of 90 meters, with a trunk diameter of 7.5 m. Trees 30 years old have attained a height of 45 m. in California.

The trunk is very straight and erect, its branches are rather short, forming a symmetrical, conic tree. The bark is not very thick, usually flaking off at frequent intervals, leaving a smooth, grayish or greenish surface; often, however, it persists in long, stringy masses, especially near the base. The twigs are 4-sided

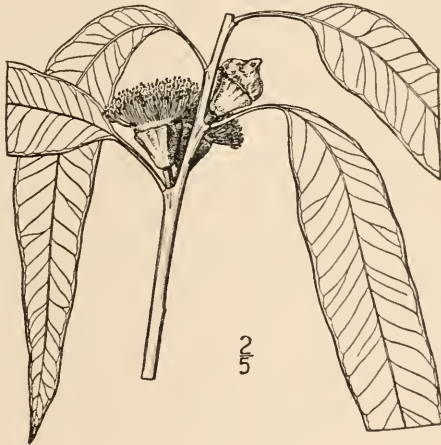


FIG. 671. — *Eucalyptus*.

on young trees. The leaves are alternate, those of the young plants being very unlike those on mature branches; the former are opposite, ovate, equally rounded at the base, and sessile, light colored and of a dusty appearance; those of older plants are thick and leathery, lanceolate, 1.5 to 3 dm. long, scythe-shaped, unequally rounded at the base, long taper-pointed, thickened at the margin, smooth, bluish green and pellucid punctate, both sides similar; they stand edgewise on the slender stalks, and have a strong, aromatic, camphor-like odor. The flowers, in axillary clusters of 2 or 3, are large and showy; the calyx-tube is angular and warty, obovoid; the calyx-lobes adhere to each other and come off in the form of a lid; there is no corolla; the stamens are very numerous; anthers small, light

yellow; the ovary is inferior. The fruit is a hard, dry, globose, angular capsule, flattened on top, where it opens by several pores; it contains numerous small seeds.

The wood is hard, very strong and durable, close-grained and pale brown. It is used in general construction, ship-building, for piles, railroad ties, telegraph poles, insulator pins, and largely for fuel.

The leaves are used in medicine; the volatile oil obtained from them is highly antiseptic, especially valuable for inhalation. The tree is more extensively planted for ornament, various utilities, and for forestry purposes than any other species of its genus. It requires a warm climate.

The genus is very large; about 150 species are known, principally in Australia, where they are of great economic importance as timber trees. They yield valuable volatile oils, from the leaves or bark, differing widely in odor and specific properties; an astringent extract is prepared by evaporation of the sap of several species and is known as Australian, Botany bay, or Eucalyptus kino. The bark of some of the species is also used for tanning; a saccharine excrescence produced by *Eucalyptus mannijera* Mudie and *E. viminalis* Labillardière is known as Eucalyptus manna. The generic name is Greek, in reference to the lid-like portion of the calyx; *Eucalyptus obliqua* L'Héritier, of New South Wales, is the type of the genus.

THE GINSENG FAMILY

ARALIACEÆ Ventenat



HIS family comprises about 52 genera, including some 450 species of herbs, vines, shrubs, or trees, of wide distribution, but especially numerous in the tropics. The well-known evergreen climber, Ivy, *Hedera Helix* Linnæus, of Europe, frequently planted, is probably the best known member of the family; several are of importance as drugs, especially Ginseng, the root of *Panax quinquefolium* Linnæus, of woods in eastern North America, valuable more on account of oriental superstitions than for any therapeutic properties. Spikenard, the root of *Aralia racemosa* Linnæus, has more therapeutic value as a tonic and alterative, and is much used in domestic practice.

The *Araliaceæ* have stipulate, alternate mostly compound leaves. The flowers are perfect or polygamous, regular, variously clustered, often in great masses of umbels; the calyx is joined to the ovary, 5-lobed; the corolla has mostly 5, sometimes 10 petals, inserted on the margin of the calyx; the stamens are of the same number as the petals and alternate with them, their filaments short and distinct; anthers introrse; the ovary is inferior, 2- to 5-celled, crowned by a disk; the styles are of the same number as the cells of the ovary and sometimes united, the stigmas simple; ovules 1 to each cell. The fruit is a berry or drupe; the seeds are solitary, flattened or somewhat 3-angled; endosperm wanting; embryo small and straight. One arborescent species occurs in our area.

HERCULES CLUB

GENUS **ARALIA** [TOURNEFORT] LINNÆUS

Species ***Aralia spinosa*** Linnæus



ARALIA comprises about 30 species, mostly herbs, natives of North America and Asia. It is the typical genus of the family Araliaceæ, which includes genera with many arborescent species in warm and temperate regions, a number of trees of this relationship occurring in tropical America. *Aralia racemosa* Linnæus, an herbaceous plant of our woodlands, is the type of the genus.

The Hercules club, the only tree of the family existing in the wild state, within the geographical area covered by this book, grows in moist or wet woodlands from southern New York to Florida, westward to Pennsylvania, Indiana, Missouri, and Texas. It is also known as Spikenard tree, Angelica tree, and Tooth-

ache tree, and, erroneously, Prickly ash. It attains a maximum height of about 13 meters, with a trunk 3 dm. thick, but is usually much smaller.

The trunk, branches, and leaf-stalks are very prickly. The thin bark is brown outside and yellow within. The young twigs are very stout. The terminal bud is blunt, nearly 2 cm. long, the lateral ones flattened and much smaller. The leaves are alternate, often a meter long or more, twice pinnate; the numerous leaflets are ovate, thick, pointed, stalked, toothed, 2.5 to 10 cm. long, dark green



FIG. 672. — Hercules Club.

above, very pale and sometimes a little hairy beneath; the bases of the stout leaf-stalks sheath the stem. The tree blossoms from June to August. The small white flowers are very numerous in hairy paniced umbels; each individual flower is about 4 mm. broad and slender-stalked; each umbel is subtended by several small bractlets; the calyx is minute; there are 5 spreading petals, 5 stamens alternating with the petals, a 5-celled inferior ovary, and 5 styles. The fruit is an ovoid black berry about 6 mm. long, becoming 5-lobed when mature.

The tree is of rapid growth and much planted for ornament. The wood is of little value, being brittle, soft, and weak. Both the bark of the root and the berries have a limited use in domestic medicine.

THE DOGWOOD FAMILY

CORNACEÆ Link



CORNACEÆ include about 20 genera with some 90 species of trees, shrubs, or herb-like shrubs, principally natives of the northern hemisphere. They are of no special economic value; some are very ornamental, not only for the profusion of flowers, brilliant fruit, and autumnal foliage, but also for their beauty of form and handsome twig coloration during the winter.

The *Cornaceæ* have alternate, opposite or whorled, mostly firm and leathery leaves, which are usually entire and without stipules. The flowers are perfect or diœcious, disposed in cymes or heads, with or without a general involucre. The calyx-tube is 4- or 5-toothed, rarely entire; the corolla consists of 4 or 5 petals, valvate or imbricated, inserted at the base of a disk and spreading; stamens usually of the same number as the petals or more, and inserted with them, their filaments round or flattened; anthers attached at the base or back; ovary 1- to 4-celled, inferior; styles united, short or long; stigma entire, lobed or cleft; ovules solitary in each cavity or rarely 2. Fruit mostly a drupe with an acrid flesh; stone solitary, rarely 2, containing 1 to 4 cells; seeds oblong, the embryo nearly as large as the endosperm; cotyledons leafy.

Our arborescent genera are:

Flowers diœcious or polygamo-diœcious; stigmas lateral.

Stigmas 2; ovules 2 in each cavity; staminate flowers in catkin-like spikes.

1. *Garrya*.

Stigma 1; ovules 1 in each cavity; staminate flowers in heads.

2. *Nyssa*.

Flowers perfect; stigmas terminal.

Flowers in open cymes, not subtended by a large involucre; fruit surmounted by the style.

3. *Cornus*.

Flowers in heads subtended by a large involucre; fruit surmounted by the calyx.

4. *Cynoxylon*.

I. SILK TASSEL TREE

GENUS **GARRYA** DOUGLAS

Species ***Garrya elliptica*** Douglas



HIS small evergreen tree or shrub grows in rich sandy soils by streams in the Coast ranges from Monterey, California, northward to the Columbia River, where it attains its greatest dimensions, a height of 6 meters and a trunk diameter of 5 dm.

The bark is thin, nearly smooth, greenish. The twigs are stout, somewhat

4-angled, hairy, soon becoming dark brown or gray and marked by encircling leaf scars. The leaves are opposite, thick and leathery, elliptic, 4 to 8 cm. long, rounded, sharp, or bristle-pointed at the apex, rounded or truncate at the base, revolute and wavy on the margin, dark green and smooth above, densely woolly



FIG. 673. — Silk Tassel Tree.

beneath; the leaf-stalks are short and united at the base. The flowers, appearing from December to February, are in clusters of drooping spikes; they have no corolla; the staminate spikes are 5 to 12 cm. long, with sharp-pointed, silky bracts; the calyx is silky-hairy, with 4 valvate lobes; stamens 4, with distinct filaments; the pistillate inflorescence is stouter, 5 to 8 cm. long, with sharp-pointed bracts, the calyx somewhat 2-lobed, the ovary densely silky-hairy, sessile, 1-celled and 2-ovuled, the 2 styles stigmatic on the inner

sides. The fruit is a subglobose purplish hairy drupe, about 8 mm. in diameter, 1- or 2-celled, the flesh red, the juice staining purple; the seed is oblong, compressed, 4 mm. long; the embryo is small; cotyledons oblong. The fruit ripens in early autumn and becomes nearly or quite smooth with age.

The wood is hard, close-grained, grayish brown, polishes well, but checks badly; it has been used for fancy cabinet work. This tree is often planted on the Pacific coast, staminate ones being preferred on account of their more ornamental flower clusters. It is also called Quinine bush and Fringe tree.

Garrya was named by David Douglas in honor of Mr. Nicolas Garry, of the Hudson Bay Company, who aided him in his travels to the Northwest. There are perhaps 20 species, all American, natives of the Pacific slope, Texas, Mexico, and the West Indies; the one here described is the type species.

II. THE TUPELOS

GENUS **NYSSA** [GRONOVIVS] LINNÆUS



NYSSA contains about 7 species of large trees, or rarely shrubs, with alternate branches, occurring in eastern North America, southern and central Asia. Fossil leaves found in the arctic regions of Europe and in western North America have been referred to this genus.

The leaves are alternate, often leathery, mostly entire, stalked and conspicu-

ous for their autumnal coloration. The flowers, appearing with the leaves, are small, greenish, polygamo-dioecious, in small clusters, short racemes or sometimes solitary on slender axillary peduncles. The staminate flowers are numerous, their calyx cup-shaped, 5-lobed; petals 5, small, fleshy, rarely none; stamens, 5 to many, borne on an entire or lobed disk. The pistillate flowers, 2 to many or solitary, are on axillary peduncles; calyx 5-toothed; petals small or minute; stamens several, usually abortive; ovary sessile, 1- to 2-celled, with a solitary ovule; style slender, recurved, its apex stigmatic. The fruits are fleshy drupes, solitary or clustered, ovoid or oval; the stone is large, bony, more or less ridged; seed usually 1, completely filling the cavity; embryo in abundant fleshy endosperm.

The name applied to these trees by Linnaeus is that of a water nymph, on account of the aquatic habit of the type species, *N. aquatica*. One additional species, a shrub, *Nyssa acuminata* Small, occurs in the southern Atlantic States.

Our arborescent species are:

Pistillate flowers 2 to several; drupe 1 to 1.5 cm. long; stone ridged.

Stone much flattened, prominently ridged.

Stone little flattened, indistinctly ridged.

Pistillate flower 1; drupe 3 to 4 cm. long; stone sharp edged or winged.

Leaves acuminate; pedicels longer than the blue or purple drupe.

Leaves blunt, minutely tipped; pedicels shorter than the red drupe.

1. *N. biflora*.

2. *N. sylvatica*.

3. *N. aquatica*.

4. *N. Ogeche*.

I. WATER GUM — *Nyssa biflora* Walter

The Water gum, also called the Black gum, and Water tupelo, inhabits swamps and the margins of ponds from New Jersey to Florida and Louisiana, where it attains a maximum height of 40 meters, with a trunk diameter of 2 m.

The trunk gradually tapers from a swollen base; when growing in water the tree produces many thick erect roots which rise to the surface. The branches are slender and spreading, the tree roundish topped; the bark is about 3 cm. thick, furrowed into rough longitudinal ridges of a dark reddish brown color; the twigs are slightly hairy at first, soon becoming smooth and reddish brown; the winter buds are about 3 mm. long, sharp pointed and dark brown. The leaves are thick and firm, oblong to oblanceolate, or nearly obovate, 5 to 15 cm. long, sharp or blunt-pointed, usually tapering at the base, the margin entire; they are smooth on both sides when mature, the leaf-stalk 15 mm. long or less. The tree flowers in April or May. The



FIG. 674. — Water Gum.

The tree flowers in April or May. The

staminate flowers are on slender pedicels, in long-stalked umbels; the pistillate 2 together, at the end of a long stalk, with ovate blunt petals. The fruit is in clusters of 2 on a stalk 2 to 6 cm. long, oval to elliptic, 10 to 13 mm. long, dark blue; the acrid pulp is rather thin; stone oval, prominently ribbed.

The wood is very similar to that of the Sour gum, of which this tree is sometimes considered a race or variety.

2. SOUR GUM—*Nyssa sylvatica* Marshal

Nyssa multiflora Wangenheim

This well-known tree, also called Tupelo, Tupelo gum, Black gum, Yellow gum, Pepperidge, and Stinkwood, is of frequent occurrence in wet or moist soil, from Maine to Ontario, Michigan, Florida and Texas, attaining its greatest di-



FIG. 675. — Sour Gum, New York Botanical Garden.

mensions, 50 meters high, and a trunk diameter of 1.5 m., in the southern Alleghany Mountains.

The trunk is stout, thick and straight, the branches slender, widely spreading or

drooping, forming trees of variable outline; the bark is 2 to 4 cm. thick, deeply furrowed into longitudinal scaly ridges of a brown color. The twigs are slender, sometimes quite hairy, greenish yellow, soon becoming smooth and red-brown; the winter buds are 6 mm. long, blunt-pointed; the leaves are oval or obovate, rarely oblanceolate, 5 to 15 cm. long, blunt, sharp or taper-pointed, more or less rounded at the base, entire or irregularly wavy on the margin, hairy when unfolding, but becoming smooth and shining; the leaf-stalk is 1 to 2.5 cm. long. The flowers, appearing from April to June, are on slender, hairy peduncles 12 to 25 mm. long, the staminate in many-flowered clusters, the pistillate usually in clusters of 3; the calyx-lobes are small, ovate; the petals are thick, ovate and blunt. The fruit, usually in clusters of 3, ripening in September or October, is ovoid, about 1.5 cm. long, dark blue; its thin pink flesh is acrid and bitter; the stone is narrowly ovoid, sharp pointed at the top, its walls hard, with 10 to 12 indistinct ribs.

The wood is soft, very tough, yellowish white; its specific gravity is about 0.63. It is hard to split, but not durable unless kept dry. It is used for rollers, wheel-hubs, ox-yokes, and other special purposes where a light, non-splitting wood is required, and is much esteemed for docks and wharves.

Its characteristic branching, glossy green leaves, with their gorgeous crimson autumnal coloration, and the abundant blue fruit, make this tree a handsome object for lawn or park; it requires moist soil for its perfect development.



FIG. 676. — Sour Gum.

3. TUPELO GUM — *Nyssa aquatica* Linnæus

Nyssa uniflora Wangenheim

A water-loving tree, also called Cotton gum, Swamp tupelo, Large tupelo, and Olive tree. It is found in cypress and other swamps from Virginia to Missouri and southward to Florida and Texas, attaining a maximum height of 35 meters, with a trunk diameter up to 1.5 m. above the much enlarged base.

The branches are rather short and spreading or ascending. The bark is 6 to 10 mm. thick, ridged, and broken into small scales of a dark brown color. The thick twigs are reddish and finely velvety when young, becoming smooth or nearly so, round and brown. The terminal buds are nearly globular, the lateral ovoid. The leaves are thick and firm, ovate to elliptic, 1 to 3 dm. long, sharp or taper-pointed, wedge-shaped, rounded or slightly heart-shaped at the base, entire or

angular-toothed on the margin, dark green, shining and nearly smooth above, pale and thinly woolly beneath; the leaf-stalk is stout, hairy, 2 to 5 cm. long. The flowers, which appear from March to May, are on long, slender, hairy stalks, the staminate in dense globose heads 1 to 1.5 cm. in diameter; the pistillate flowers are solitary, subtended by several linear bracts 8 to 12 mm. long; the petals are oblong and blunt, much shorter than the calyx-tube; the style is coiled or curved at the top. The fruit, ripening in September, is borne on a slender stalk 4 to 9 cm. long; it is oblong or oblong-obovoid, nearly 3 cm. long, usually dark purple; the flesh is thin and acrid, the stone ovate, slightly flattened, pointed at the base, and has about 10 sharp ridges; the seed is compressed.



FIG. 677. — Tupelo Gum.

The wood is soft, weak, close-grained, light brown, with a specific gravity of about 0.52, and is used for woodenware, packing-boxes, and crates. It is not known to have been successfully brought into cultivation.

4. OGECHÉ PLUM — *Nyssa Ogeche* Marshall.

This is a round-headed tree, known also as the Ogeche lime, Gopher plum, Wild lime tree, and Tupelo. It is peculiar to the swamps of South Carolina, Georgia, and Florida, attaining a maximum height of about 20 meters, with a trunk diameter up to 6 dm., usually much smaller and sometimes shrubby.

The bark is about 5 mm. thick, broken into large dark brown scales. The twigs are reddish velvety, becoming nearly smooth, gray to brown. The buds are about 4 mm. long, blunt, and covered with hairy scales. The leaves are firm, oblong, oblanceolate or obovate, 5 to 20 cm. long, rounded and minutely tipped at the apex, narrowed or rounded at the base, entire margined, dark green, somewhat shining, and nearly smooth above, pale and softly hairy beneath; the leaf-stalk is stout and grooved, 5 to 20 mm. long. The flowers



FIG. 678. — Ogeche Plum.

appearing from January to May, are greenish yellow, the staminate in rather dense globose heads, 1 to 1.5 cm. in diameter, on slender stalks 1 to 2.5 cm. long; the pistillate flowers have nearly orbicular petals, and are solitary on stout woolly stalks, which in fruit are 1 to 1.5 cm. long. The fruit, which ripens in summer, remains on the tree until after the leaves fall; it is oblong, 3 to 4 cm. long, smooth, bright red, and tipped with the pointed base of the style; the flesh is thick, juicy, and sour; the stone is oblong, flattened, its thick hard walls have 10 or 12 membranous wings.

The wood is coarse-grained, tough but weak, white or nearly so, its specific gravity about 0.46; like that of its close relatives it is hard to split. The ripe fruit is made into preserves.

III. THE CORNELS

GENUS **CORNUS** [TOURNEFORT] LINNÆUS



CORNUS includes some 25 species of trees or shrubs with opposite or seldom alternate branches, natives principally of temperate regions of the northern hemisphere. One is reported from Peru. They are most abundant in North America, where at least 15 species are known. They are of no special economic value. Some are very ornamental, when in flower or in fruit, and also admired for their brightly colored branches in winter.

The leaves are rather thick, entire, opposite, or rarely alternate. The flowers are perfect, small, in terminal or axillary clusters, usually in forking cymes; the corolla-tube is bell-shaped, 4-toothed; petals 4, valvate, rather long, white; stamens 4, the filaments thread-like or awl-shaped; anthers ovate, attached on the back; ovary 2-celled or rarely 3-celled, the stigma truncate or capitate. The fruit is a drupe, usually globose, the pulp thin with a hard 2-seeded stone; seeds flattened, the embryo in fleshy endosperm.

The generic name is the Greek for horn, in reference to the compact hard wood of most of the species. The generic type is *Cornus Mas* Linnæus, the Cornelian cherry, a shrub or small tree of Europe. Our species are referred by some authors to the genus *Svida* Opiz.

Our arborescent species are:

Leaves alternate; fruit blue-black.

1. *C. alternifolia*.

Leaves opposite.

Leaves smooth; fruit pale blue.

2. *C. stricta*.

Leaves rough-hairy; fruit white.

3. *C. asperifolia*.

1. BLUE CORNEL — **Cornus alternifolia** Linnæus

This small tree, or more often tall shrub, is also known as the Purple dogwood, Umbrella tree, Pigeonberry, and Green osier. It grows on the borders of woods or along streams and swamps, from New Brunswick and Nova Scotia to

Minnesota, Georgia, Alabama, and Missouri. Its maximum height is about 9 meters, with a trunk diameter of 2 dm.

The trunk is usually very short; the branches are somewhat verticillate, long, rather slender, and nearly horizontal, forming a broad flat-topped bushy head. The bark is about 3 mm. thick, smooth or shallowly fissured and dark red-brown. The twigs are slender, smooth, greenish yellow to brown. The winter buds are sharp-pointed, covered by shining brown scales. The leaves are thin, alternate, very rarely opposite, oval to ovate, 7.5 to 20 cm. long, sharply slender-pointed at the apex, narrowed or rounded at the base, slightly toothed or entire on the margin, yellowish green and smooth or but slightly hairy above, whitish and hairy beneath, with a broad yellowish midrib; the leaf-stalk is slender, grooved, 3 to 5 cm. long. The flowers, appearing from May to July, are in terminal cymes 4 to 7 cm. across, on pedicels 3 to 6 mm. long; the calyx is narrow

cup-shaped, slightly toothed, and hairy; the petals are narrowly oblong, about 3 mm. long. The fruit is subglobose, about 1 cm. in diameter, bluish black; the flesh is dry and bitter, the stone obovoid, thick-walled, grooved, with 1 or 2 crescent-shaped seeds about 6 mm. long.

The wood is hard, close-grained, reddish brown; its specific gravity is about 0.67. The striking form, beautiful foliage, profusion of bloom, pretty red-stemmed, blue fruit, and autumnal coloration, make this a most desirable small tree in any situation.

2. STIFF CORNEL

Cornus stricta Lambert

Usually a shrub, this is also called Stiff dogwood, and grows in swamps from Virginia to Missouri southward to Florida and Texas, sometimes becoming 5 meters high.



FIG. 679. — Blue Cornel.



FIG. 680. — Stiff Cornel.

The branches are slender, stiff and ascending, forming a narrow head. The bark is thin, close, greenish or grayish brown, the twigs slender, round, reddish brown to purplish. The leaves are opposite, firm, elliptic, oval to ovate, 4 to 12 cm. long, taper-pointed at the apex, narrowed or tapering at the base, slightly wavy or quite entire on the margin, green and slightly appressed-hairy above, paler and somewhat hairy beneath; the leaf-stalk is 5 to 15 mm. long. The flowers, appearing in April or May, are in loose, flat compound cymes 3 to 6 cm. across, on nearly smooth pedicels; the calyx-tube is urn-shaped and woolly; the corolla is 5 to 6 mm. across, the petals linear-oblong or linear-lanceolate, pointed and white. The fruits are subglobose drupes about 6 mm. in diameter, of a pale blue color, supported on stout pinkish stalks; the stone is somewhat oblique, 3 to 4 mm. broad, slightly less in length, faintly ribbed and scarcely furrowed.

As a shrub this plant takes the place at the South of the well-known northern Panicked cornel, *Cornus candidissima* Marshall, to which it is very similar, except in the different color of its fruit and twigs.

3. ROUGH-LEAVED CORNEL — *Cornus asperifolia* Michaux

Also called Rough-leaved dogwood, this is usually a shrub, of low, wet soils and moist banks of streams from Ontario to Minnesota south to Florida and Texas, reaching a maximum height of 15 meters, with a trunk diameter of 2.5 dm.

The branches are erect, thin and stiff, forming a narrow tree. The bark is about 3 mm. thick, fissured and scaly, dark reddish brown. The twigs are slender, light green and hairy at first, soon becoming red-brown. The terminal winter buds are about 3 mm. long, sharp-pointed, the lateral ones smaller. The leaves are opposite, firm, elliptic to ovate or ovate-oblong, 5 to 15 cm. long, tapering toward the sharp apex, narrowed, rounded or somewhat heart-shaped at the base, slightly wavy-margined, or entire, rough and coarsely hairy above, paler, less rough-hairy, and prominently veined beneath; the leaf-stalk is stout, 8 to 18 mm. long, grooved and rough. The flowers, which appear from April to June in rather loose, compound cymes 5 to 8 cm. across, are nearly white; the calyx is slightly hairy, its teeth, 0.5 mm. long and sharp-pointed; the petals are lanceolate to oblong-lanceolate, blunt and recurved; the stamens are about as long as the petals. The



FIG. 681. — Rough-leaved Cornel.

fruit is subglobose, 6 mm. in diameter, and white; its stone is oblique, about 3 mm. broad, little compressed, slightly angled, and faintly furrowed around the edge.

The wood is hard, close-grained, and brownish.

The Silky Cornel, *Cornus Amomum* Miller, a well-known shrub growing along stream-banks and in low woods and meadows from New Brunswick to the Dakotas, south to Florida and Texas, is said to become arborescent and 6 meters tall in the valleys of the southern Appalachian region. It differs from the above in its purplish twigs, softer, silky foliage and slightly larger, pale blue fruit with a more pointed and less angular stone.

IV. THE DOGWOODS

GENUS **CYNOXYLON** RAFINESQUE



CYNOXYLON is characterized by its conspicuous involucre of petal-like bracts. There are 2 species, both small trees, natives of North America, whose showy blossoms and neat habit make them valuable for ornament. The wood is hard and is used for tools, and in turnery; the astringent bark has been used medicinally.

The leaves are opposite, rather thick, prominently veined, and turn brilliant scarlet in autumn. The flowers are perfect, small, greenish or yellow, in dense clusters, which are surrounded by the conspicuous corolla-like involucre; the calyx-tube is somewhat cylindric, 4-lobed; corolla of 4 yellowish valvate petals; stamens 4, exserted, the filaments slender; anthers elliptic, attached at the back; ovary 2-celled, sessile; style terminated by the slender depressed stigma; ovules solitary in each cell, pendulous. The fruit is a red drupe, with thin, acrid flesh, and an elongated, 2-seeded stone; seeds oblong; embryo straight in the fleshy endosperm.

The generic name is Greek for Dogwood, *C. floridum* being the type species

Involucre bracts notched at apex; eastern tree.

1. *C. floridum*.

Involucre bracts not notched at apex; western tree.

2. *C. Nuttallii*.

1. DOGWOOD — **Cynoxylon floridum** (Linnæus) Rafinesque.

Cornus florida Linnæus

This small bushy round-headed tree is probably the most showy woody plant of eastern North America when in bloom, and has received many popular names, among those most frequently used being Flowering dogwood, Boxwood, False boxwood, New England boxwood, and Flowering cornel. It occurs in forests, from Massachusetts and Ontario to Minnesota, south to Florida and Texas, and is also reported from Mexico. It attains a maximum height of about 15 meters, with a trunk diameter of 5 dm.

The bark is 3 to 6 mm. thick, broken up into numerous small scales, dark brownish gray to nearly black in color. The twigs are round, light green or reddish, smooth or nearly so, soon changing to light brown or reddish gray, and bear-



FIG. 682. — Dogwood, New York Botanical Garden.

ing many leaf scars. The terminal winter buds are oblong, covered by two opposite scales; the flower buds are terminal, subglobose, covered by 4 scales, which enlarge and become white in spring, and form the involucre. The leaves are thick and firm, elliptic to ovate, 6 to 18 cm. long, rather sharply taper-pointed, narrowed or rounded at the base to the stout, grooved leaf-stalk, slightly toothed

or entire, bright green and slightly hairy, with impressed midrib above, pale, more densely hairy, and prominently veined beneath. The flowers, appearing from March to June according to latitude, are in dense, stout-stalked heads, surrounded by a conspicuous involucre of usually 4 showy, white or pinkish, veined petal-like bracts;

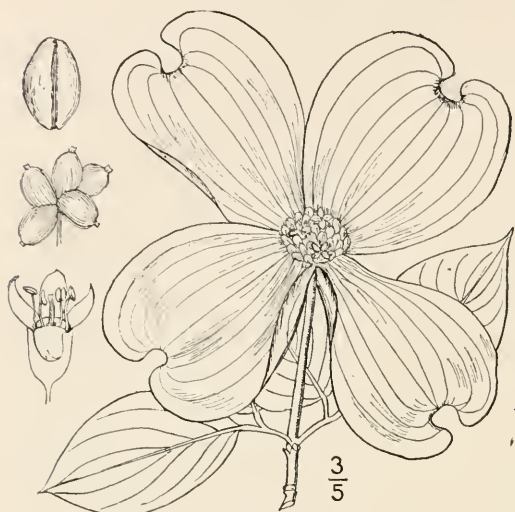


FIG. — 683. — Dogwood.

these, when fully grown, are obovate, 4 to 6 cm. long, notched and thickened at the apex, the discolored portion being that which formed the bud covering during the winter. The flowers are sessile in the axils of small deciduous bractlets; the calyx is green, narrowly funnel-shaped, the lobes nearly triangular, as broad as long; the petals are linear, 3 to 4.5 mm. long, obtuse, reflexed, and greenish yellow; the 4 stamens are exserted. The clustered fruits are ovoid or oblong, about 1.5 cm. long, bright red, capped by the remains of the calyx; the flesh is thin, mealy, and acrid; the stone is elliptic,

pointed at each end, 2-grooved, containing 2 oblong seeds, or often only 1 seed.

The wood is hard, tough and strong, close-grained, shining, red-brown; its specific gravity is about 0.81. It is a favorite wood with turners in the manufacture of parts of machinery, wagon-wheel hubs, tool-handles, and has been tried for wood engravers' blocks. The bark has been used as a remedy for fevers. As an ornamental tree it is unsurpassed in its fine form, profusion of showy bloom in spring, and its abundance of scarlet fruits, and autumnal coloration in late fall; forms with light red bracts, and others with pendulous branches, are often seen in parks and private grounds. The fruit is much eaten by birds.

2. WESTERN DOGWOOD — *Cynoxylon Nuttallii* (Audubon) Shafer

Cornus Nuttallii Audubon

A magnificent tree, and perhaps even more beautiful than its eastern relative, having larger and often more numerous bracts, and fruiting more profusely. It inhabits evergreen forests from British Columbia southward to the mountains of southern California, reaching its greatest development, about 30 meters tall, with a trunk diameter of 6 dm., in the northern part of its range.

The bark is 6 to 8 mm. thick, fissured into small persistent red-brown scales; the twigs are light green and hairy, soon becoming smooth or nearly so, dark purple to red-brown and marked by prominent leaf scars. The winter buds of the leaves are about 1 cm. long, and similar to those of the preceding species; the

flower buds differ, however, in being naked, the flower clusters not being enclosed by the bracts, which are only at their bases. The leaves are quite thin, ovate to somewhat obovate, sharp or short taper-pointed at the apex, and tapering at the base, slightly scalloped on the margin, bright green and sparingly hairy with impressed venation above, whitish-hairy and prominently veined beneath, the leaf-stalk short, stout, grooved, and hairy. The flowers appear from May to July, and occasionally in the autumn, in dense heads, surrounded by an involucre of 4 to 6 showy white or pink petal-like bracts, each 4 to 8 cm. long, 1.5 to 5 cm. wide, narrowly oblong to obovate, or rarely orbicular in outline, variously pointed or blunt



FIG. 684. — Western Dogwood.

at the apex, thickened and contracted toward the base, strongly veined and reticulated; the calyx is yellow-green or purplish with darker lobes; the petals linear, blunt, usually spreading, yellowish green or pale purple. The drupes, crowded in globular heads of 20 to 40, are about 12 mm. long, ovoid, but more or less flattened; they are light red or orange-colored, bearing the persistent calyx; the flesh is thick, containing a grooved blunt-pointed 1- or 2-seeded stone.

The wood is hard, close-grained, light red-brown and satiny, with a specific gravity of about 0.74, and is used for cabinet work and tool handles.

This beautiful tree has not to our knowledge been successfully grown in the northeastern States.

THE WHITE ALDER FAMILY

CLETHRACEÆ Klotzsch



HIS small family consists of the single genus *Clethra*, with about 30 species of trees or shrubs, occurring in North and South America, Japan, and the Pacific islands. They have no economic value except for ornament; the common Sweet pepper-bush of the eastern United States, *Clethra alnifolia* Linnæus, is a well known ornamental shrub and Bee plant, with strongly sweet-scented flowers, and is well worth a place in any roomy garden, and other species are occasionally planted.

The Clethraceæ have alternate, deciduous, simple leaves. The flowers are perfect, regular and small, in showy terminal elongated racemes or panicles; the calyx is 5-cleft or 5-parted, persistent, its lobes imbricated in the bud; corolla white, of 5 partially united, deciduous petals; stamens 10, their filaments slender; the anthers arrow-shaped, inverted, their sacs opening at the apex; ovary superior, 3-angled or 3-lobed, 3-celled and hairy; ovules numerous; styles united and terminated by a 3-lobed stigma. The fruit is a dry, subglobose, 3-lobed capsule, splitting into 2-cleft valves at maturity; seeds very small and numerous; endosperm fleshy. One of our species occasionally becomes arborescent.

MOUNTAIN SWEET PEPPER BUSH

GENUS **CLETHRA** [GRONOVIVS] LINNÆUS

Species ***Clethra acuminata*** Michaux



ALSO called Mountain white alder, this is a small tree or shrub of mountain woods from Virginia and West Virginia to Georgia and Alabama, reaching a maximum height of 6 meters.

The branches are usually erect or nearly so. The bark is thin, close, red-brown, exfoliating in papery scales exposing the greenish gray inner layers. The twigs are somewhat angular, hairy and grayish, becoming round, scaly, glaucous and red-brown. The short-stalked leaves are crowded near the ends of the branches, rather thin, ovate or elliptic, 10 to 20 cm. long, taper-pointed, tapering or rounded at the base, finely toothed on the margin except near the base, light green and smooth above, paler, somewhat glaucous and hairy, especially on the brownish veins, beneath. The white fragrant flowers appear from June to August in spreading or recurved, densely hairy racemes 5 to 20 cm. long; the pedicels, with caducous bracts, are shorter than the flowers; calyx densely

hairy, the 5 lobes ovate, 3.5 to 5 mm. long, sharp-pointed and strongly ribbed; petals erect, wedge-shaped, 6 to 7 mm. long, notched at the apex; stamens 10, their filaments very hairy; style elongated, smooth. The fruit is an ovoid, very



FIG. 685. — Mountain Sweet Pepper Bush.

hairy, nodding capsule, 5 mm. long, tipped by the long style; seeds numerous, very small, roughish and of a light brown color.

The generic name is the ancient Greek name of the Alder, which the leaves of the generic type, *C. alnifolia* Linnæus, somewhat resemble; one other species is a shrub of the southeastern States.

THE HEATH FAMILY

ERICACEÆ de Candolle



HIS family consists of about 55 genera, comprising some 1050 species of trees or shrubs of wide geographic distribution, from arctic to tropic regions; they are of no especial economic value except in medicine. The leaves of the Bearberry, *Arctostaphylos Uva-ursi* Linnæus, a small trailing shrub, are largely used in medicine; Wintergreen, *Gaultheria procumbens* Linnæus, was formerly important on account of its volatile oil, from which salicylic acid, a valuable remedy for rheumatism, and a useful antiseptic, was obtained; this, however, is now secured more cheaply from other sources, and the oil, which is also a favorite flavoring agent, is being replaced by a very similar product obtained from the twigs and bark of the Cherry birch, *Betula lenta* Linnæus. Many members of this family are highly ornamental and some are well known in cultivation, particularly the Azaleas, Rhododendrons, and Kalmias; in Europe various species of *Erica* are also much grown.

The Ericaceæ have alternate, or rarely opposite or whorled, simple, usually leathery and persistent leaves, without stipules. The flowers are variously clustered, perfect or mostly so; the calyx consists of 4 to 7 distinct or partly united sepals; the corolla is regular, or slightly 2-lipped, gamopetalous, but the usually 5 lobes sometimes nearly separate, the stamens equal in number or twice the number of the corolla-divisions, their filaments usually distinct; the anthers are 2-celled, the sacs sometimes prolonged upward; the ovary is composed of 2 to 5 united carpels; styles united; stigma capitate or peltate; ovules usually numerous. The fruit is a woody capsule, dryish drupe or berry-like; seeds numerous, or sometimes solitary in each cell; endosperm fleshy; embryo central; cotyledons short.

Petals separate.

1. *Elliotia*.

Petals united into a gamopetalous corolla.

Fruit a dry, dehiscent, woody capsule.

Capsules opening septicidally.

Corolla without pouches for the anthers; capsule elongated, not depressed.

2. *Rhododendron*.

Corolla with pouches for the anthers; capsule spherical or depressed.

3. *Kalmia*.

Capsules opening loculicidally.

Flowers in axillary clusters; corolla globose; anthers opening at apex; leaves leathery, scurfy beneath.

4. *Xolisma*.

Flowers in terminal clusters; corolla ovoid-cylindric; anthers opening lengthwise; leaves membranous, smooth.

5. *Oxydendrum*.

Fruit fleshy, indehiscent, berry-like or drupe-like.

Ovary 5-celled, the cells many-ovuled; fruit many-seeded.

6. *Arbutus*.

Ovary 4- to 10-celled, the cells 1-ovuled; fruit 4- to 10-seeded.

7. *Arctostaphylos*.

I. ELLIOTTIA

GENUS **ELLIOTTIA** MUHLENBERGSpecies **Elliottia racemosa** Muhlenberg

ELLIOTTIA is one of the most local and rarest of trees, as it is known only from a limited area in the sand hill country of southeastern South Carolina and adjacent Georgia; its maximum height is 6 meters, with a trunk diameter of about 1 dm., but it is mostly a shrub.

The trunk is short, the branches upright and ascending. The bark is thin, close, smooth and gray; the twigs are round, slender, slightly hairy, reddish brown, becoming smooth, and dark brown. The terminal winter buds are about 6 mm. long, ovoid, sharp-pointed and covered by shining brown scales; the lateral buds are smaller. The leaves are rather firm in texture, oblong, elliptic or oblong-ob lanceolate, 6 to 15 cm. long, tapering toward each end, minutely tipped, entire-margined, dark green, smooth and shining above, paler, somewhat glaucous and softly hairy along the yellowish veins beneath; the leaf-stalk is slender, and softly hairy, 1 to 4 cm. long. The flowers appear in June and July, in loose narrow panicles 1 to 4 dm. long, on slender pedicels 1 to 2 cm. long. The calyx is 3 to 3.5 mm. broad, with 4 broadly ovate, pointed, irregularly toothed lobes; corolla 12 to 15 mm. long, the petals 4, linear-oblong, white, more or less recurved; stamens 8, about 8 mm. long, their filaments flattened; anthers arrow-shaped, opening lengthwise; ovary sessile, 4-celled, borne on a fleshy disk, narrowed into the long style, which is club-shaped and bent at the apex; stigma small, minutely 3-lobed; ovules numerous in each cavity. The fruit is capsular and is only known from a single weather-beaten specimen, collected by Dr. R. M. Harper; this is globose, 5 mm. in diameter, somewhat irregular, 4-valved; the seed is unknown.



FIG. 686. — Elliottia.

The genus consists only of this North American species. Two Japanese plants, now referred to the genus *Tripetaleia* Siebold and Zuccarini, have been placed in this genus by earlier writers. The name commemorates the distinguished southern botanist, Stephen Elliott (1771-1830), author of a treatise on the southern flora.

II. THE RHODODENDRONS

GENUS **RHODODENDRON** LINNÆUS

RHODODENDRON comprises about 100 species of shrubs, and a few small trees of the northern hemisphere, about 10 species being indigenous to North America. They are of little economic value, although the leaves and bark have at times been recommended as medicinal agents; their chief value lies in the great beauty of the plants, especially when in flower.

They have persistent, alternate, thick, leathery, entire leaves. The flowers are large and very showy, in terminal clusters, perfect, unfolding from large cone-like winter buds. The calyx is persistent, 5-lobed or 5-parted; the corolla is nearly bell-shaped, variously colored, 5-lobed, slightly irregular, the 3 upper lobes being more spreading than the 2 lower; stamens usually 10, exserted, declined or equally spreading, somewhat unequal; filaments white or colored; anthers attached on the back, opening by apical pores, without appendages; ovary mostly 5-celled; style long and slender; stigma capitate or lobed; ovules numerous. The fruit is a dry, mostly 5-valved linear-oblong capsule, with numerous small seeds.

The name is Greek, meaning a Rose tree; the type species is *R. ferrugineum* Linnæus, of the Old World.

Eastern: leaves very thick; pedicels glandular or pubescent.

Calyx-lobes oblong or ovate, obtuse, 4 to 6 mm. long.

Calyx-lobes triangular, acute, 1 to 2 mm. long.

Western: leaves not so thick; pedicels smooth

1. *R. maximum*.

2. *R. catawbiense*.

3. *R. californicum*.

1. GREAT LAUREL — **Rhododendron maximum** Linnæus

This handsome small evergreen tree or shrub is also called Rhododendron, Laurel, Big laurel, Big leaf laurel, Deer tongue laurel, Mountain laurel, Rose bay laurel, Dwarf rose bay tree, and Spoon hutch. It occurs from Nova Scotia and Ontario southward in the mountains to Georgia and Alabama. It is rather rare at the north, where it occurs but sparingly in swamps; southward in the mountains it is abundant along steep stream banks and in hilly woods, reaching a maximum height of about 12 meters, with a trunk diameter of 3 dm.

The often bent trunk is usually short; the branches are stout, stiff and crooked, often interlocking and forming dense thickets. The bark is about 1.5 mm. thick, covered with red-brown scales. The twigs are stout, round, covered with stiff hairs, green, becoming reddish gray. The winter leaf-buds are axillary, formed the previous summer. The flower-buds are pointed, 3.5 to 5 cm. long. The leaves, which remain upon the branches for two or three years, are thick and leathery, oblong-oblancoate, 10 to 25 cm. long, sharp or abruptly taper-pointed, wedge-shaped or rounded at the base, entire and slightly revolute on the margin, more

or less glandular hairy at first, becoming dark green and shining above, pale and scurfy beneath; leaf-stalk about 3 cm. long. The flowers open in June and July in umbel-like clusters 10 to 13 cm. across, on slender, hairy pedicels 2.5 to 4 cm. long; calyx bell-shaped, its lobes blunt, longer than the tube; corolla white or pink to purplish, 3 to 6 cm. across, more or less mottled with yellow, the lobes rounded; stamens 8 to 12, their filaments more or less bearded, and of various lengths; ovary glandular hairy; style white, thickened at the apex; stigma scarlet, 5-lobed. The fruit is oblong or ovoid-oblong, 1.5 cm. long, hairy, tipped with the remnants of the style; the numerous seeds are oblong, fringed at the ends.

The wood is hard, strong, close-grained and light brown; its specific gravity is about 0.63. It is used in turnery, for tool-handles, and has been tried in wood engraving. The bark is sometimes used domestically as a remedy for rheumatism and other diseases. The plant is highly ornamental and is now being used in large quantities for planting in parks and on large lawns, for which purposes wild plants are usually secured from the mountains; it blooms after most of the brighter colored hybrid *Rhododendrons* are past.



FIG. 687. — Great Laurel.

2. MOUNTAIN ROSE BAY

Rhododendron catawbiense Michaux

This evergreen shrub, sometimes becomes a small tree, and is also called Catawba *Rhododendron* and Carolina *Rhododendron*. It occurs mostly on mountain sides and summits, from Virginia and West Virginia to Georgia and Alabama, attaining a maximum height of 6 meters, with a trunk diameter of 1 dm.

The trunk is short, crooked, and much branched, the branches stout. The bark is thin, close and scaly. The twigs are hairy, green or purplish, becoming smooth, marked by prominent leaf scars and gray or grayish brown. The leaves are thick



FIG. 688. — Mountain Rose Bay.

and leathery, oblong or oval, 8 to 12 cm. long, pointed at the apex, rounded, narrowed, or somewhat heart-shaped at the base, revolute on the margin, dark green, smooth and shining above, pale and glaucous with the midrib prominent beneath; the leaf-stalk is stout and broad, about 3 cm. long. The flowers appear in May and June in dense clusters often 13 cm. across, on stout pedicels which are hairy at first, but become smooth, 3 to 3.5 cm. long; calyx short, the lobes triangular and sharp-pointed; corolla lilac-purple, 4 to 6 cm. across, longer than broad, its lobes irregularly scalloped, and notched at the apex; ovary ribbed and hairy; capsules oblong or oblong-ovoid, 1.5 to 2 cm. long, the long style and the calyx persisting; seeds numerous and small.

This most beautiful species is mainly confined to the higher peaks of the southern mountains, growing in large areas, and when in bloom gives a distinct color to the landscape. It is sparingly used for ornamental planting and is one of the parents of some of the beautiful garden forms that are so largely imported from Europe.

3. CALIFORNIA RHODODENDRON — *Rhododendron californicum* Hooker

An evergreen shrub, at times a small tree, also called Mountain laurel and California mountain laurel; it occurs on rich slopes and in ravines of the Cascade Mountains and along the coast from Mendocino county, California, northward to British Columbia, reaching a maximum height of 7.5 meters.



FIG. 689. — California Rhododendron.

Its branches are stout, erect or nearly so. The bark is thin, close, and scaly. The twigs are stout, smooth or nearly so, and reddish green, becoming red-brown. The leaves are broadly oblong, 7 to 15 cm. long, abruptly short pointed, usually tapering at the base, very slightly revolute on the margin, rather thin, leathery, smooth, light green above, pale, smooth, with prominent rounded midrib beneath;

the broad petiole is 1.5 to 2 cm. long. The rose-colored flowers are in large, dense clusters on long, slender pedicels. The calyx is small, the lobes slightly hairy; the corolla is broadly bell-shaped, 5 cm. across, streaked with red and spotted with yellow, the tube short, the lobes broad, wavy and crisp margined; stamens 10, unequal, shorter than the corolla, rose-colored; filaments incurved at the apex, thickened and downy at the base; anthers deep pink; ovary ellipsoid, brown, silky hairy, 5-celled; style longer than the stamens; stigma 5-lobed. The capsule is oblong, 2.5 to 4 cm. long.

III. MOUNTAIN LAUREL

GENUS **KALMIA** LINNÆUSSpecies ***Kalmia latifolia*** Linnæus

HIS beautiful small evergreen tree or shrub is well known from New Brunswick and Ontario to Ohio, Arkansas, Florida and Louisiana. In the North it grows mostly in moist soil near swamps, but southward it is found on dry or rocky hillsides, reaching a maximum height of 12 meters, with a trunk diameter of 5 dm. It is so well known that it has received a great many common names, such as Laurel, American laurel, Poison laurel, Sheep laurel, Small laurel, Wood laurel, Calico bush, Calico flower, Calico tree, Ivywood, Spoonwood, Mountain ivy, and Poison ivy.

The trunk is usually short, often crooked, the branches widely forked. The bark is about 2 mm. thick, furrowed, dark reddish brown. The twigs are slightly angular, somewhat viscid-hairy, green or reddish, soon becoming smooth, shining, and brown. The leaf-buds are small and axillary, the tips of the twigs often dying in winter. The leaves are persistent, alternate, rarely in pairs, stiff and leathery, elliptic to oblong-lanceolate, taper-pointed, dark green above, paler and yellowish green with a broad, yellowish midrib beneath; the leaf-stalk is stout, nearly round, 5 to 20 mm. long. The showy, fragrant flowers appear from March to July in corymbs 10 to 15 cm. across, on slender, glandular hairy pedicels 1 to 3 cm. long; calyx smooth, deeply divided into 5 narrow, pointed lobes 2 mm. long; corolla white or pink, wheel-shaped with 10 depressions in the limb, 2 to 2.5 cm. across, with 10 keels and 5 shallow, round lobes, marked with purple lines; stamens 10, their filaments shorter than the corolla; anthers awnless, opening by pores at the apex; ovary 5-celled; style long, slender and exserted. The fruits persist on the branches until the following spring; they are capsules 5 to 7 mm. in diameter, depressed-globose, tipped by the long style, and subtended by the persistent calyx-lobes, 5-celled and many-seeded, borne on erect stalks; seeds small, oblong, brown.



FIG. 690. — Mountain Laurel.

Its wood is hard, strong, close-grained and reddish brown, the specific gravity about 0.72. It is occasionally used like the wood of the Great laurel, and the bases are dug up and made into imitation Briarwood pipes, sometimes called Ivy pipes. The leaves are reputed to be very poisonous to man and cattle, and

also of medicinal value, but this is probably greatly exaggerated, so that its chief value lies in its beauty and hardness as an ornamental plant, for which it is surpassed by few others.

The genus, of which this is the type species, is a small one of about 7 species, strictly North American, occurring from Alaska to Cuba. The name is in commemoration of Peter Kalm (1715-1779), a Swedish naturalist of Linnæus' time, who traveled extensively in eastern North America about 1750.

IV. XOLISMA

GENUS *Xolisma* RAFINESQUE

Species *Xolisma ferruginea* (Walter) Heller

Andromeda ferruginea Walter



SMALL evergreen tree or shrub, of the pinelands of the coastal plain from South Carolina to Florida, sometimes called Titi; it attains a maximum height of 9 meters, with a trunk diameter of 2.5 dm.

The trunk is slender, often crooked, the branches slender and stiff. The bark is 3 to 6 mm. thick, furrowed and scaly; reddish brown. The twigs are slender, densely scurfy. The leaves are persistent, leathery, elliptic to obovate



FIG. 691. — *Xolisma*.

or oblanceolate, 2.5 to 7 cm. long, sharp or taper-pointed, tapering at the base, thick, entire and revolute on the margin, roughish when unfolding, becoming smooth, pale green and shining above, pale and rusty scurfy with prominent midrib beneath, the venation prominent on either side; the leaf-stalk is enlarged at the base, thick and short. The flowers appear from February to May, in axillary, crowded leafy bracted panicles, on slender, recurved stalks 5 to 10 mm. long. The calyx is cup-shaped, about 3.5 mm. across, the lobes as broad as long, abruptly

pointed and scurfy; the corolla is globose, white or pinkish, 2.5 to 3 mm. across; its 5 lobes are sharp-pointed, reflexed, and fringed on the margin; stamens 10, their filaments bent; anthers short, smooth, not appendaged; ovary thickly whitish-woolly; style slightly longer than the corolla and smooth; stigma truncate. The fruit is a dry capsule, oblong-ovoid or oval, 4 to 6 mm. high, 4- to 6-ribbed; seeds numerous, very small, narrowly oblong, winged at the ends.

The wood is hard, weak, close-grained, light reddish brown and satiny; its

specific gravity is about 0.75. This tree deserves a place in parks and lawns of warm temperate regions on account of its peculiar foliage and profusion of small flowers.

Xolisma, of which this species is the type, contains about 10 species, occurring in North and Central America and the West Indies. The name is Greek and is supposed to have been intended for *Cholisma*, meaning defective, in reference to the smaller corolla and other differences from closely related genera.

V. SOURWOOD

GENUS **OXYDENDRUM** DE CANDOLLE

Oxydendrum arboreum (Linnæus) de Candolle

Andromeda arborea Linnæus



THIS tree is the only species of its genus, and occurs in woodlands from southern Pennsylvania and Maryland to Florida, westward to Indiana, Tennessee, and Louisiana. It attains a maximum height of about 20 meters, with a trunk diameter of about 5 dm. It is locally known as Sorrel tree, Elk-tree, Sour gum, Arrowwood, Titi, and Lily-of-the-Valley tree.

The smooth bark is thick, reddish gray and furrowed. The young twigs are smooth, light green, becoming orange to brown. The alternate deciduous leaves are shining, 10 to 15 cm. long, oblong to oval-lanceolate, sharply and finely toothed, rather long-pointed, smooth and bright green on both sides, narrowed at the base; the leaf-stalks vary from 1 to 2 cm. in length. The numerous white flowers are in nodding, clustered racemes at the ends of branches, and open in June or July; their short, ashy-hairy stalks bear 2 minute bractlets at about the middle; there are 5 short sepals, which remain attached to the base of the ashy-hairy fruit; the corolla is ovoid-cylindric, 6 or 7 mm. long, and 5-toothed; there are 10 stamens



FIG. 692. — Sourwood.

about as long as the corolla, the filaments wider than the linear anthers, which open by long chinks to release the pollen; the ovary is 5-celled and is surmounted by a slender columnar style, which is tipped by the minute stigma. The fruits, borne on curved stalks, are ovoid-pyramidal, rather woody, and 4 to 6 mm. long, 5-angled, tipped by the style, and split into 5 valves when mature.

The wood is hard and reddish brown. The tree is valuable for ornamental planting as far north as Massachusetts, often flowering when less than 2 meters

high. The leaves turn scarlet in autumn. The name is Greek, signifying sour wood, in reference to the acid sap.

VI. THE MADROÑAS

GENUS **ARBUTUS** [TOURNEFORT] LINNÆUS



ARBUTUS contains about 20 species of trees or shrubs of wide distribution in the temperate and warmer portions of the northern hemisphere, not occurring in eastern North America, nor eastern Asia however. They are of no special utility, but very ornamental.

They have persistent, alternate, simple, mostly entire leaves. The flowers are borne in racemose or paniculate, terminal clusters, on club-shaped stalks with persistent bracts. The calyx is persistent, free from the ovary, 5-parted, the lobes imbricated in the bud; the corolla is urn-shaped, 5-toothed, the teeth small, broad, and more or less recurved; the 10 stamens are short, inserted at the base of the corolla, their filaments free, awl-shaped, thickened and hairy at the base; anthers short, flattened, 2-awned and open by terminal pores; ovary sessile upon a 10-lobed disk, 5-celled, seldom 4-celled, the style exserted; ovules many in each cell. The fruit is drupe-like, globose, smooth or glandular, the flesh dry and mealy; stone of 5, many-seeded, separable parts; the seeds are small, more or less angular, short-pointed, somewhat hairy.

The name is an ancient one of the Old World *Arbutus Unedo* Linnæus, Strawberry tree, the type of the genus. Our species all become arborescent.

Leaves ovate to oblong; bark red-brown.

Ovary smooth; Pacific Coast tree.

Ovary hairy; Texan and Mexican tree.

Leaves lanceolate to oblong-lanceolate; bark gray; ovary smooth; tree of Arizona and Mexico.

1. *A. Menziesii*.

2. *A. texana*.

3. *A. arizonica*.

I. MADROÑA — **Arbutus Menziesii** Pursh

A large evergreen tree extending from British Columbia to southern California, attaining its greatest dimensions of about 33 meters tall, with a trunk diameter of 2.1 m., in northern California; in the southern part of its range and on high mountains it is often a mere shrub. It is also called Madroña tree, Madrove, Manzanita, Laurelwood, and Laurel.

The trunk is usually straight, the branches stout, upright and spreading, forming a round headed tree when uncrowded. The bark is 8 to 12 mm. thick, broken into small, thick, dark red plates, brighter red and thinner on younger stems. The twigs are smooth, green, yellow or light red, becoming bright red. The buds are 8 mm. long, blunt-pointed, bright red. The leaves are thick and leathery, oval to elliptic-ovate, 8 to 15 cm. long, rounded or abruptly taper-pointed, wedge-shaped, rounded or slightly heart-shaped at the base, somewhat thickened, revolute, and

entire or sometimes wavy toothed on the margin, dark green and shining above, much paler, with prominent venation beneath; the leaf-stalk is stout, 12 to 25 mm. long. The flowers appear from March to June, according to latitude, in terminal panicles, 12 to 15 cm. across; the pedicels are slender, minutely hairy, and bracteolate; the calyx is 5-parted, white and dryish, 3 mm. long; the corolla is globular, white and 5-lobed; ovary smooth, upon an obscurely 10-lobed disk. The fruit, ripening in September, is a 5-celled, berry-like drupe, subglobose, obovoid or oval 12 mm. long, bright orange; the stone is 5-parted, leathery, each part containing several seeds which are small, angular, brown, and hairy.

The wood is hard, strong, close-grained, light reddish brown; its specific gravity about 0.70; it is used to a slight extent for furniture and largely burned for charcoal, for use in the manufacture of gunpowder. The astringent bark has been used in tanning and in medicine. It is the handsomest and largest member of the Heath family, at least in North America.



FIG. 693. — Madroña.

2. TEXAN MADROÑA — *Arbutus texana* Buckley

Arbutus xalapensis S. Watson, not Humboldt, Bonpland and Kunth



FIG. 694. — Texan Madroña.

A small evergreen tree or shrub, entering southwestern Texas from adjacent Mexico, where it is quite abundant; it grows on hills, attaining a maximum height of 6 meters, with a trunk diameter of 2.5 dm. It is also called Mexican madroña, Madroña tree, Manzanita, and Laurel.

The trunk is very short and much branched, the branches more or less crooked and spreading. The bark is about 6 mm. thick, furrowed, dark brown and separates into plates; on younger stems it is

thinner, red-brown, and peels off in thin scales. The twigs are rather stout, round, hairy and bright red, becoming darker and scaly. The leaves are thick and leathery, ovate to oblong, 2.5 to 8 cm. long, rounded or pointed at the apex, rounded or narrowed at the base, usually entire on the margin, dark green, smooth and shining above, pale and smooth or slightly hairy and reticulate beneath, the leaf-stalk more or less hairy, 2.5 to 4 cm. long. The flowers appear in March or April, in terminal panicles 5 to 8 cm. across; the pedicels are stout, hairy, about 8 mm. long, with a bract at the base. The calyx is shallow, its lobes sharp-pointed; the corolla is white, ovoid, contracted above the middle, about 7 mm. long, the lobes broad and blunt; ovary whitish hairy. The fruit ripens in late summer, is subglobose, glandular, about 8 mm. in diameter, dark red, the flesh thin; stone thick, the 5 cells containing many, slightly hairy seeds.

Its wood is hard, close-grained, reddish brown; its specific gravity is about 0.75. It is locally used for tool-handles, and by the Mexicans in saddlery.

3. ARIZONA MADROÑA — *Arbutus arizonica* (A. Gray) Sargent

Arbutus xalapensis arizonica A. Gray



MOST beautiful evergreen tree, growing in gravelly soils, at elevations of about 2100 meters, in the mountains of southern Arizona and adjacent Mexico; its maximum height is about 15 meters, with a trunk diameter of 6 dm.



FIG. 695. — Arizona Madroña.

The trunk is tall and rather stout, the branches stout and spreading. The bark of the trunk is 8 to 12 mm. thick, furrowed and scaly, light gray or whitish, that of younger stems thinner, smoother and dark red. The twigs are stout, crooked, somewhat hairy, reddish brown, becoming purplish with a bloom, and finally red. The leaves are lanceolate or oblong, 4 to 8 cm. long, sharp-pointed, wedge-shaped, or seldom rounded at the base, thickened and

usually entire on the margin, bright green and smooth above, pale and smooth beneath; the leaf-stalk is slender, somewhat hairy, 1 to 2.5 cm. long. The flowers appear in May or June in terminal panicles 5 to 6.5 cm. across; pedicels stout, hairy, 6 mm. long, with a bract at the base; calyx-lobes short, white and dry; corolla ovoid, abruptly contracted above the middle, about 8 mm. long, its lobes rounded; ovary glabrous, pitted, upon a prominently 10-lobed disk. The fruit

is globose to oblong, 6 to 8 mm. long, orange-red, with thin flesh. Seeds compressed, minutely hairy.

The wood is soft, close-grained, reddish brown, its specific gravity about 0.71.

VII. THE MANZANITAS

GENUS **ARCTOSTAPHYLOS** ADANSON



ARCTOSTAPHYLOS contains probably 40 species of shrubs, some of which occasionally become small trees, others low and prostrate; they occur in the northern hemisphere and are most abundant in western North America; best known is the Bearberry, *Arctostaphylos Uva-ursa* (Linnaeus) Sprengel, the type of the genus, a low spreading plant, which encircles the globe in the cooler portions of North America, Europe, and Asia; its leaves have long been used in medicine on account of their diuretic and tonic properties. The fruits of some of our western species are pleasantly acid and are made into jellies; they were an important food for the Indians and are a favorite food of bears.

They have persistent, alternate, thick, leathery leaves, and small flowers borne in terminal racemes, spikes or panicles, subtended by scale-like bracts. The calyx is small, 5-lobed; the corolla mostly urn-shaped, white to rose-colored, with 5 recurved teeth; stamens 8 to 10, included, their anthers opening by terminal pores and supplied with 2 tail-like appendages; ovary 4 to 10-celled; ovules solitary and suspended in each cavity. The fruit is drupe-like, with a hard, leathery skin, dryish mealy flesh, and 4 to 10 hard, woody or almost bony, stone-like, 1-seeded nutlets, which are more or less firmly consolidated.

The name is Greek, meaning bear-grape or bear-berry. The following species become arborescent:

Twigs rather bristly-hairy; bracts of the inflorescence leaf-like; ovary hairy. 1. *A. tomentosa*.

Twigs smooth or but slightly hairy; bracts of the inflorescence scale-like;

ovary smooth.

Pedicels smooth; leaves dullish green.

2. *A. Manzanita*.

Pedicels glandular-hairy; leaves pale and glaucous.

3. *A. glauca*.

1. WOOLLY MANZANITA — *Arctostaphylos tomentosa* (Pursh) Douglas

Arbutus tomentosa Pursh

An evergreen shrub of the northwest from British Columbia to northern California, especially in the Cascade and Coast Mountains, reaching at its greatest development, in southwestern Oregon, a height of 6 meters, with a trunk diameter of 2 dm.

The twigs are bristly-hairy, grayish green, becoming reddish brown. The leaves are ovate to oblong-elliptic, usually entire, sometimes minutely toothed; they are light green above, paler and somewhat hairy beneath, 3 to 6 cm. long; the leaf-

stalk is covered with long whitish hairs and is 1 cm. long or less. The flowers are in short panicles with conspicuous lanceolate leaf-like bracts, which are usually longer than the short hairy pedicels and taper-pointed corolla. The ovary is densely hairy. The fruit, ripening in August, is hairy and about 6 mm. in diameter, yellowish to red; pulp relatively thick; nutlets easily separable or united into pairs.



FIG. 696. — Woolly Manzanita.

The wood is hard, tough and strong, close-grained, reddish or dark brown, and heavy; it takes a fine polish and is used in Oregon for fancy cabinet work and in turnery. The fruits are edible.

Anderson's Manzanita, *Arctostaphylos Andersoni* A. Gray, is reported as sometimes becoming arborescent and 6 m. high, with a trunk base 3 dm. in diameter; it occurs in the Redwood forests of Santa Cruz county, and in San Mateo county, California, and differs from the preceding in its thinner, heart-shaped sessile leaves, more bristly twigs, wider and more hairy bracts of the inflorescence, and has a more southern range.

2. LARGE MANZANITA — *Arctaphylos Manzanita* Parry

An erect evergreen shrub or small tree, often 8 meters tall; a noted tree in Napa county, California, has a height of 10.5 meters, a trunk diameter of over 1 m. and a spread of over 10 m. It is frequent in the Coast Mountains of California, forming dense thickets on the mountain sides, extending northward into Oregon.

The trunk is erect, usually much branched, often from near the ground. The bark is thin and smooth, dark reddish, peeling off freely in large flakes, exposing the greenish younger bark, which



FIG. 697. — Manzanita.

soon becomes red. The twigs are minutely hairy, ashy-gray, becoming reddish brown. The leaves are ovate to ovate-oblong, blunt or pointed, rounded, or sometimes tapering at the base, entire on the margin; they are stiff and leathery usually turned upward by a twist of the stout petiole, which is 6 to 18 mm. long, dullish green and smooth on both sides. The flowers appear from November to March, and are usually in perfection at Christmas, in crowded, somewhat paniculate clusters, on smooth pedicels, their bracts broad, taper-pointed; calyx closely appressed to the broadly urn-shaped, whitish or pinkish corolla; stamens included; filaments slightly hairy; ovary smooth or nearly so. The fruit ripens in July or August, is globose, about 8 mm. in diameter, bright brownish red and shining; stone consisting of 5 to 7 more or less firmly united roughish nutlets.

The berries have an agreeable sour, mealy flesh, and are used for jelly. They were an important article of food of the Californian Indians. The leaves, containing about 8 per cent. of tannin, have been used as an astringent medicine. The brightly shining red branches are employed in the manufacture of rustic work; the wood is used for fuel.

3. LARGE FRUITED MANZANITA — *Arctostaphylos glauca* Lindley

An erect shrub or small tree, with a much branched trunk up to 7.5 meters tall, and 3 dm. in diameter, occurring along the Coast Mountains from Mount Diablo, California, southward.

The twigs are glabrous throughout, the leaves elliptic to broadly ovate, 2 to 5 cm. long, sharp or blunt-pointed, rounded or slightly heart-shaped at the base, entire on the margin, or on vigorous young shoots often toothed; they are thick and stiff, pale green, smooth and glaucous on either side, with stout leaf-stalks 6 to 12 mm. long. The flowers appear in March, in flattish, compact panicles, on glandular hairy pedicels pendent in bud, the bracts broad, abruptly taper-pointed, the lowest often leaf-like. The corolla is about 7 mm. long and white. The fruit, which is the largest of our species, is slightly longer than thick, about 18 mm. in diameter, slightly resinous-viscid, dull red; the pulp is thin, white and granular; nutlets completely consolidated into a round stone, sometimes 12 mm. in diameter.

Its leaves are said to be used in the form of an extract, as a remedy in catarrhal affections.

The Viscid manzanita, *Arctostaphylos viscida* Parry, a common shrub of the Coast Mountains and Sierra Nevada foothills, where it occurs with the Cypresses,



FIG. 698. — Large Fruited Manzanita.

is said to occasionally become arborescent; it differs from the above-described species in its greener leaves, redder young twigs, erect flower-buds, stiff, persistent bracts, very viscid pedicels and fruit, the latter scarcely half as large as that of *A. glauca*, and containing a relatively smaller stone, which separates into 4 or 5 rhomboidal nutlets.

Gaultheria Shallon Pursh, the Salal, an evergreen shrub of the northwest from central California to Alaska, has smooth, finely toothed ovate leaves, white flowers in one-sided racemes, and black edible fruits. It is almost always a shrub, but is reported as occasionally arborescent and about 6 meters high.

THE HUCKLEBERRY FAMILY

VACCINIACEÆ Lindley



ABOUT 20 genera of Vacciniaceæ are known, with probably 300 species of small trees or shrubs of wide geographic and altitudinal distribution.

The edible fruit of many of these plants renders them of considerable local economic importance; best known among these are the various Cranberries, the fruits of several species of *Oxycoccus*; also the Whortleberries, Huckleberries, and Blueberries (species of *Vaccinium* and *Gaylussacia*) are of considerable importance, especially in the North. Of the 5 genera, with nearly 60 species occurring in our area, but one forms a tree.

The Vacciniaceæ have alternate, simple, sometimes evergreen leaves. The flowers are perfect, usually accompanied by bracts, variously disposed in clusters, or solitary. The calyx-tube is joined to the ovary, its limb composed of 4 or 5 lobes; the corolla is usually gamopetalous with 4 or 5 lobes, or rarely of distinct petals, deciduous; the stamens are borne at the base of the corolla, and usually double the number of its divisions; filaments usually short and flattened; anthers attached by the back, 2-celled, the connective entire or 2-parted; ovary inferior, 2 to 10-celled, crowned by a disk, the style filiform, the stigma simple or minutely 4- or 5-toothed; ovules solitary or several in each cell. The fruit is a pulpy, globular drupe or berry, its 2 to 10 cells 1-seeded or more; seeds small; endosperm fleshy; embryo central.

TREE HUCKLEBERRY

GENUS **BATODENDRON** NUTTALL

Species **Batodendron arboreum** (Marshall) Nuttall

Vaccinium arboreum Marshall



HIS small tree or shrub is also called Farkleberry, Sparkleberry, Myrtleberry, Gooseberry, and Blueberry; it occurs in the sandy soils of the Gulf States from North Carolina to Florida and Texas, being most abundant in pinelands; its maximum height is 9 meters, with a trunk diameter of 2.5 dm.

The trunk is usually short, the branches slender and crooked. The bark is about 2.5 mm. thick, close, red-brown and scaly. The twigs are slender, hairy, reddish, becoming smooth and dark red. The winter buds are blunt, 2.5 mm. long. The leaves are thin, leathery, oval or obovate, 2.5 to 5 cm. long, pointed,

minutely tipped, more or less wedge-shaped at the base, slightly revolute and glandular on the margin; they are reddish and hairy when unfolding, becoming deep green and shining with some hairs along the venation above, paler, glaucous and smooth except along the principal veins beneath; the leaf-stalk is short and broad; in the southern part of its range the leaves persist until the new ones are fully unfolded. The flowers appear from March to May, according to latitude, in spreading, bracted racemes or panicles 5 to 8 cm. long, on slender, drooping pedicels 8 to 12 mm. long; the corolla is bell-shaped, white or pinkish, the 5 lobes sharp-pointed and reflexed, one half to one third the length of the tube; stamens



FIG. 699. — Tree Huckleberry.

10, their filaments distinct and shorter than the anthers, which are 2-awned on the back; ovary inferior, 5-celled; style exserted. The fruits are subglobose berries, often remaining upon the branches until the following spring, 5 to 6 mm. in diameter, black and shining, the flesh dryish and astringent; seeds many.

The wood is hard, very compact, light reddish brown, and satiny; its specific gravity is about 0.76. It is used like other very hard woods, for tool-handles and other turned ware. The genus, of which this species is the type, is a small one, consisting of 4 known species, all North American. The name is Greek, signifying Blackberry tree.

THE MYRSINE FAMILY

MYRSINACEÆ Lindley



HIS family comprises about 30 genera, including some 475 species of trees or shrubs of the tropical and subtropical regions of both hemispheres. They are of very little economic importance, a few producing edible fruits and several are cultivated in conservatories for ornament, the best known, perhaps, being the *Ardisia*, *Ardisia crenata* Sims, a beautiful dark-green foliaged shrub, with brilliant scarlet fruit, for which it is much admired, especially if well grown, and popular for Christmas decoration.

The Myrsinaceæ have mostly alternate, simple, leathery, punctate leaves without stipules. The inflorescence is racemose, corymbose, or clustered on scaly spurs; the flowers are regular, perfect, or polygamo-dicæcious; the inferior calyx consists of 4 to 6 or rarely more, persistent, usually glandular sepals; the corolla is flat, salverform, or wheel-shaped, the tube very short, the lobes spreading, reflexed, or curled back, often glandular like the calyx; stamens 4 to 7, opposite the corolla-lobes and joined to the base or the tube of the corolla; filaments sometimes united into a tube; ovary of 4 to 7 united carpels, 1-celled, the styles united; stigma capitate. Fruit a dryish drupe, often leathery, globular, rarely obovoid, often tipped by the style; seeds solitary, entirely filling the cavity, often lobed at the base; endosperm copious, surrounding the embryo.

Two genera, each represented by a single species, occur in southern Florida.

Stamens joined to the base of the corolla-lobes; anthers blunt; flowers lateral. 1. *Rapanea*.

Stamens joined to the throat of the corolla-tube; anthers acute; flowers terminal. 2. *Icacorea*.

I. MYRSINE

GENUS *RAPANEA* AUBLET

Species *Rapanea guianensis* Aublet



SMALL tree or shrub of the coasts of peninsular Florida and the Keys, and occurring throughout the Bahamas and other West Indies, to South America. Its maximum height is about 6 meters, with a trunk diameter of 16 cm. It is the type of the genus, which includes 100 species or more, natives of tropical regions.

The trunk is sparingly branched; the branches are straight and ascending. The bark is thin, close, and grayish. The twigs are slender, round, smooth, grayish or reddish brown and marked by numerous leaf scars. The leaves are alternate,

clustered near the ends of the twigs, leathery, obovate to oblong, 4 to 10 cm. long, blunt or notched at the apex, entire, revolute-margined, bright green, smooth and



FIG. 700. — *Myrsine*.

shining above, paler beneath; the leaf-stalk is short; the small flowers are polygamo-dioecious, sessile or nearly so, scattered along the twigs; the calyx is bell-shaped, 1 mm. high, the 5 or 6 sepals broadly ovate, blunt or sharp-pointed and spotted with purple; the corolla is wheel-shaped, whitish, 4 mm. across, 3 times longer than the calyx, its 5 or 6 lobes unequal, oblong, usually blunt, glandular-ciliate and like the calyx spotted and striped with purple; stamens as many as there are corolla-lobes and joined to their base; the filaments are very short; anthers arrow-shaped, blunt, shorter than the corolla lobes and introrse; the ovary is

1-celled; ovules several, immersed in the placenta, only 1 maturing; style elongated; stigma capitate. The fruits are in clusters surrounding the branchlets; they are subglobose, dryish drupes 4 mm. in diameter, bluish or black, short-stalked, tipped at the apex by the persistent style; seed solitary.

The wood is hard, strong, rather close-grained, light yellowish brown.

II. MARLBERRY

GENUS *ICACOREA* AUBLET

Species *Icacorea paniculata* (Nuttall) Sudworth

Cyrilla paniculata Nuttall. *Ardisia Pickeringia* Torrey and Gray



THIS small, slender tree, more often a shrub, of southern Florida, the Bahamas, and other West Indies, is also known as Cherry. It reaches a height of 7.5 meters, with a trunk diameter of about 1.5 dm.

The trunk is short, its branches slender and ascending. The bark is about 3 mm. thick, light gray to white, scaly, inner layers dark brown. The twigs are stout, round, slightly hairy, reddish brown or gray. The leaves are deciduous, alternate, thick and leathery, oblanceolate to obovate or elliptic, 8 to 16 cm. long, sharp or blunt-pointed, wedge-shaped and narrowed at the base, entire, thickened and revolute on the margin, yellowish green and smooth above, paler with prominent yellow midrib beneath. The flowers are fragrant, appearing in the autumn and winter, in panicles 5 to 12 cm. long, on slender, bractless pedicels; the calyx is bell-shaped, 2 mm. high, deeply 5-lobed, the ovate, sharp-pointed

lobes hairy-fringed; corolla wheel-shaped, 1 cm. across, the 5, rarely 4 or 6 lobes, oblong to obovate, blunt, reflexed, and marked by purplish lines and dots; the stamens are of the same number as the lobes of the corolla and inserted at the top of its tube; filaments very short and broad; anthers orange-colored, longer than the filaments; the ovary is globose, gradually contracted into a long, slender style, capped with a simple, disk-like stigma. The fruit, ripening in spring, is a depressed globose, dryish berry 7 to 9 mm. in diameter, subtended by the persistent calyx and tipped by the base of the style, becoming black and shining when fully



FIG. 701. — Marlberry.

ripe; seed solitary, depressed, somewhat kidney-shaped, 3 mm. long, punctate and reddish brown.

The wood is hard, very dense, brown, marked by darker bands; its specific gravity is about 0.86.

The genus comprises about 200 species, mostly tropical shrubs and trees, of both hemispheres. Some of them are said to produce edible fruits, but otherwise they are of no economic importance. The name was used by the natives of Guiana for the type species, *Icacorea guianensis* Aublet.

THE THEOPHRASTA FAMILY

THEOPHRASTACEÆ D. Don



HIS small family consists of about 5 genera, with some 70 species of tropical American trees or shrubs, usually evergreen, and of no economic value.

They have persistent, entire, yellowish leathery leaves. The flowers are perfect, regular, racemose, cymose or paniced. The calyx is bell-shaped with 5 imbricated sepals; corolla bell-shaped, wheel-shaped or salver-form, 5-lobed, with 5 petal-like staminodes at the base of the corolla-lobes, inside of which are 5 stamens joined to the base of the corolla-tube and opposite its lobes; ovary 1-celled, enclosing many ovules attached to the central placenta; styles united; stigma simple, usually 5-lobed and hidden by the converging anthers. The fruit is a globular, leathery berry, with few or many seeds; endosperm thick and hard, surrounding the embryo. A single arborescent species occurs in Florida.

JOEWOOD

GENUS *JACQUINIA* LINNÆUS

Species *Jacquinia keyensis* Mez



SMALL tree or shrub of the coasts of southern peninsular Florida, and the Bahamas, reaching a maximum height of about 6 meters and a trunk diameter of 2.5 dm.

The branches are stout, stiff, ascending and spreading, forming a dense round head. The bark is smooth, gray to nearly white. The twigs are somewhat angular, softly and finely hairy, greenish yellow, becoming round, smooth, brown-gray and marked with yellowish leaf scars. The leaves are densely clustered, persisting until the new ones unfold, leathery, wedge-shaped, spatulate or oblong-obovate, 3 to 7 cm. long, blunt, notched or minutely tipped, tapering at the base, entire and revolute on the margin, yellowish green, dotted, smooth and shining above, dull beneath; leaf-stalk short, hairy, thickened at the



FIG. 702. — Joe wood.

base. The deliciously fragrant flowers, appearing during the winter months, are perfect and regular, in terminal smooth, many-flowered racemes 2 to 6 cm. long, on stout pedicels about 1 cm. long; the calyx is bell-shaped, with 5 orbicular, blunt sepals; the corolla is white, salverform, about 1 cm. across, the spreading lobes longer than the tube, oblong and blunt; filaments flat, broad at the base, the anthers oblong or ovate, extrorse, 2-celled; ovary ovoid, 1-celled; stigma slightly 5-lobed; ovules numerous, not immersed in the placenta. The fruit, ripening in



FIG. 703. — Joewood, Bahamas.

the autumn, is a leathery, orange-red berry, subglobose, 8 to 10 mm. in diameter, tipped by the remnants of the style, skin thin and hard.

The wood is hard and very dense, brown, with darker medullary rays; its specific gravity is about 0.69.

The genus contains probably 35 species of shrubs or trees peculiar to tropical America. The name is in commemoration of Nicholas Joseph Jacquin (1728-1818), an Austrian botanist, who spent many years in tropical America. *J. armillaris* Jacquin, of the West Indies, is the type of the genus.

THE SAPODILLA FAMILY

SAPOTACEÆ Reichenbach



APOTACEÆ comprise some 35 genera, including about 400 species of trees or shrubs, the greater number of which are inhabitants of the tropics. Their economic value depends upon the milky sap which most of them contain. Gutta-percha is the concrete juice of *Palaquium Gutta* (J. D. Hooker) Burke, of the Malay region; perhaps other trees also yield it. Balata gum and Gum chicle are similar products; the juices of some are palatable and nutritious; several edible fruits are also produced by this family.

The Sapotaceæ have mostly alternate, entire leaves without stipules. The flowers are usually perfect and complete, disposed in axillary or lateral clusters; the calyx is 4- to 12-parted, the sepals imbricated; the corolla is 4- to 12-lobed, deciduous, and sometimes furnished with appendages at the base of the lobes; stamens attached to the corolla, either at its base or to the base of its lobes and alternate with the usually conspicuous staminodes, their filaments distinct; anthers opening lengthwise, variously attached; ovary sessile, 4-celled to 12-celled, the style stigmatic tipped; ovules 1 in each cavity. The fruit is a fleshy berry, or drupe, several-seeded, or often with but 1 seed; seeds large, usually shining; endosperm fleshy or none; embryo straight.

The 6 genera occurring in our area are all represented by arborescent species.

Calyx and corolla 5-parted.

Flowers without staminodes or corolla appendages.

1. *Chrysophyllum*.

Flowers with staminodes.

Corolla without appendages.

2. *Sideroxylon*.

Corolla with appendages.

Ovary smooth; endosperm copious.

3. *Dipholis*.

Ovary hairy; endosperm scant or none.

4. *Bumelia*.

Calyx and corolla 6- to 12-parted.

Native Florida tree; seeds usually 1 or 2.

5. *Mimusops*.

Introduced into Florida; seeds 4 or 5.

6. *Sapota*.

I. SATINLEAF

GENUS **CHRYSOPHYLLUM** LINNÆUSSpecies **Chrysophyllum oliviforme** Linnaeus*Chrysophyllum monopyrenum* Swartz

HIS small evergreen tree or shrub of the West Indies also occurs in peninsular Florida and on the Keys, but is not abundant there; its maximum height is 10 meters, with a trunk diameter of 3 dm.

The branches are rather stout, ascending and somewhat crooked. The bark is 6 to 8 mm. thick, shallowly fissured into plates, with a scaly brown surface. The twigs are brownish hairy at first, becoming smooth, reddish brown to gray. The leaves are persistent, leathery, oblong, elliptic or ovate, 3 to 10 cm. long, sharp or short taper-pointed, rounded or abruptly tapering at the base, revolute on the margin, bluish green, smooth and shining with deeply impressed midrib above, silky with shining red brown hairs beneath; the leaf-stalk is stout, about 1 cm. long. The flowers are small, short-stalked, in few-flowered axillary clusters on the new growth; calyx densely silky, cup-shaped, deeply 5-parted, the sepals nearly orbicular, and rounded at the apex; corolla white, 5 mm. across, with 5 suborbicular, blunt lobes, without appendages or staminodes; stamens 5, included, their anthers nearly sessile and heart-shaped; ovary 5-celled, narrowed upward into a short style and terminated by a 5-lobed stigma. The fruit is a nodding, usually solitary oval berry about 2 cm. long, dark purple, its skin thick, tough, and slightly roughened, its flesh juicy, sweet but insipid, usually 1-seeded; seed compressed, about 12 mm. long, light brown and shining, with a white, pulpy coat.



FIG. 704. — Satinleaf.

The wood is hard, dense, strong, light brown, its specific gravity about 0.94.

The genus is a tropical one with probably 60 species of trees and shrubs, mostly American; they have milky juice and produce edible fruits, some of which are of considerable importance in tropical countries, such as the type species, *Chrysophyllum Cainito* Linnaeus, a native of the West Indies, which produces in several varieties the well-known Star-apple, and is largely cultivated in warm countries.

The name is Greek, in reference to the golden pubescence on the under side of the leaves.

II. MASTIC

GENUS **SIDEROXYLON** [DILLENIIUS] LINNÆUS

Species **Sideroxylon foetidissimum** Jacquin

Sideroxylon mastichodendron Jacquin



ALSO called Wild olive, this is a large tree of rich hammocks in peninsular Florida and the Keys, and is widely distributed in the Bahamas and other West Indies. Its maximum height is about 25 meters, with a trunk diameter of 1.5 m.

The trunk is very thick, and straight. The branches are stout, spreading and ascending. The bark is about 10 mm. thick, and splits into thick, scaly plates, gray to light reddish brown. The twigs are stout, round, smooth, finally brown and bearing large round leaf scars. The leaves are alternate, thin, leathery, ob-



FIG. 705. — Mastic.

long to oval, rarely ovate, 5 to 15 cm. long, blunt or short taper-pointed, rounded or tapering at the base, bright green, smooth and shining above, sparingly hairy at first, soon becoming smooth, shining and pale green beneath; the broad midrib is impressed above, prominent beneath; leaf-stalk pale, slender, 2 to 7 cm. long. The small flowers appear at almost any season, in clusters in the axils of the leaves, on slender stalks 1 cm. long or less; calyx green, bell-shaped, its 5 sepals suborbicular, about 2 mm. long; corolla 6 to 7 mm. across, greenish yellow, longer

than the calyx, with 5 rounded lobes; stamens equal the petals in length and number, their anthers lanceolate; filaments slender; staminodes lanceolate, long-pointed, about 1 mm. long, much shorter than the stamens; ovary 5-celled, or rarely 2- or 4-celled, oblong-ovoid, smooth, tapering into the stigmatic tipped style. The fruit, of which there is usually but 1 produced by each flower-cluster, is a 1-seeded oval drupe about 2.5 cm. long, bright yellow with a smooth tough skin and thin flesh of an agreeable acid taste; the seed is oblong-obovoid, rounded at top, narrowed toward the base, hard, brown and shining, about 1.5 cm. long; the embryo is enclosed in fleshy endosperm.

The wood is very hard, strong, close-grained and dark yellow; its specific

gravity is about 1.01. It is valued for marine construction on account of its immunity from the attacks of the Teredo; also used in ship and boat building.

The genus contains about 75 species of trees or shrubs of tropical regions. The South African *S. inerme* Linnæus, is the type. The fruit of an African species, *Sideroxylum dulcificum* A. de Candolle, the Miraculous berry, is edible. An inferior Gutta percha is obtained from *Sideroxylum attenuatum* A. de Candolle of the Philippine islands. The name is Greek, in reference to the very hard wood of these trees.

III. BUSTIC

GENUS **DIPHOLIS** A. DE CANDOLLE

Species **Dipholis salicifolia** (Linnæus) A. de Candolle

Achras salicifolia Linnæus



N evergreen tree of the hammocks of peninsular Florida and the Keys, also occurring on the Bahamas and most of the other West Indies and in tropical Mexico. Its maximum height is about 16 meters, with a trunk diameter of 5 dm. It is also called Cassada.

The trunk is straight, its branches slender and ascending, forming a round-headed tree when growing in the open. The bark is about 8 mm. thick, broken into thick, scaly plates of a reddish gray color. The slender twigs are rusty hairy, soon becoming quite smooth, gray or light reddish brown, and bear many small raised leaf scars. The leaves are persistent, alternate, thin, leathery, oblong to elliptic or elliptic-oblong, 6 to 12 cm. long, usually sharp-pointed, gradually tapering at the base to a long, slender stalk; they have some shining, brownish hairs when unfolding, soon becoming smooth, dark green and shining above, dull green and usually smooth beneath. The small flowers appear from February to May, in many dense axillary or



FIG. 706. — Bustic.

lateral clusters on stout, club-shaped stalks 2 to 3 mm. long; the calyx is bell-shaped, reddish silky-hairy, the 5 sepals ovate or oblong, 1.5 mm. long and blunt; corolla about 4 mm. across, its spreading lobes oblong or oval and rounded, equaling the tube in length, its appendages half the length of the lobes; staminodes broad and irregularly toothed, shorter than the 5 stamens, which are inserted near the base of the corolla and longer than its tube, their filaments slender;

anthers oblong, versatile, opening lengthwise; ovary ovoid, smooth, narrowed into the slender stigmatic-tipped style. The fruit is subglobose or ovoid, about 8 mm. in diameter, black, the flesh thin and dryish; seed solitary, oblong, dark brown and shining, with fleshy endosperm.

The wood is very hard, strong, fine-grained, dark brown or reddish; its specific gravity is 0.93. It takes a fine polish, but is not known to be used to any extent.

The genus is an American one, comprising about 10 species, of which ours is the type; they are all natives of the West Indies; the name is Greek, in reference to the appendages of the corolla.

IV. THE BUMELIAS

GENUS **BUMELIA** SWARTZ



BUMELIA is an American genus comprising about 30 species of trees or shrubs, indigenous from the southern United States to Brazil.

They have alternate, relatively small, leathery or membranous, persistent or deciduous leaves, which are sometimes clustered at the nodes, often bearing spines in their axils, short-stalked and often conspicuously veined. The flowers are clustered in the axils of the leaves; they are mostly perfect, small, white, and borne on slender pedicels; calyx ovoid to nearly bell-shaped, persistent, deeply and equally 5-parted, its lobes imbricated; corolla deciduous, bell-shaped, 5-lobed, with a pair of lobe-like appendages at each side of the lobes; stamens 5, inserted in the throat of the corolla, opposite its lobes; filaments thread-like; anthers arrow-shaped; staminodes 5, petaloid, attached with the stamens; ovary hairy, ovoid, 5-celled, 5-ovuled, narrowed into a short or slender, stigmatic tipped style. The fruit is a 1-seeded, fleshy, black berry, tipped with the persistent style, subtended by the persistent calyx, usually solitary, but sometimes 2 or 3 in a cluster; seed oval to oblong, light brown, smooth and shining, without endosperm, the cotyledons fleshy.

The name is Greek, having reference to an Ash, which these trees in no way resemble. *B. retusa* Swartz, of Jamaica, is the type species.

There are several shrubby species belonging to this genus in our flora, in addition to the following arborescent ones:

Leaves smooth or sparingly hairy or cottony beneath.

Fruit oblong-cylindric.

1. *B. angustifolia*.

Fruit subglobose to oval.

Leaves obovate to spatulate, broadest above the middle.

2. *B. cassinifolia*.

Leaves elliptic, broadest at the middle.

Leaves not prominently net-veined; corolla 3 mm. long, its lobes as wide as long.

3. *B. lucida*.

Leaves strongly net-veined; corolla 4 mm. long, its lobes longer than wide.

4. *B. lycioides*.

Leaves conspicuously densely hairy beneath.

Pubescence woolly, not shining.

Leaves wedge-shaped, mostly 1 to 3 cm. long.

Leaves not wedge-shaped, mostly 5 to 10 cm. long.

Pubescence silky, shining, whitish, becoming tawny or brown.

5. *B. rigida*.

6. *B. lanuginosa*.

7. *B. tenax*.

1. SAFFRON PLUM—*Bumelia angustifolia* Nuttall

Bumelia Eggersii Pierre

A small evergreen tree or shrub which grows along the coast of peninsular Florida and the Keys, and on the Bahama islands, occurring on rocky shores and borders of marshes, and attaining a height of 6 meters, with a trunk diameter up to 2 dm. It is also called Ant's wood and Downward plum.

The trunk is short, erect or ascending, its branches spreading or drooping. The bark is 8 to 12 mm. thick, deeply fissured into angular plates of a reddish gray color. The twigs are slender, slightly hairy at first, soon becoming smooth, reddish brown or gray, with spinescent branchlets. The leaves are persistent for about two years, leathery, varying from oblanceolate-spatulate to obovate, rounded at the apex, gradually narrowed to the nearly sessile base, entire and revolute on the margin, dull green on both sides. The flowers appear in autumn or early winter in crowded fascicles, on short pedicels; their calyx is smooth, deeply lobed into blunt-pointed segments 2 mm. long; corolla-lobes oval, the appendages ovate to lanceolate and taper-pointed; staminodes ovate to ovate-lanceolate, 2 mm. long, and toothed; stamens longer than the corolla; ovary ovoid, slightly hairy at the base; style elongated. The fruit, ripening in the spring, is oblong, 1.5 to 2 cm. long and black, pendent on a slender stem, usually solitary; its flesh is thick, sweet and edible.

The wood is hard, weak, dense, light brown and satiny; its specific gravity is about 0.79.

The shrub of southern Texas and adjacent Mexico, which has been referred to this species, differs in its shining leaves, slightly larger flowers with narrower oblong petals, and may be known as *Bumelia Schottii* Britton. The type specimen was collected by Mr. Schott near Laredo, Texas, July, 1853.



FIG. 707. — Saffron Plum.

2. CASSINE-LEAVED BUCKTHORN — *Bumelia cassinifolia* Small

A small, usually spiny, tree or shrub, known only from sandy woods of Louisiana, where it attains a maximum height of 10 meters, with a trunk diameter up to 1.6 dm.



FIG. 708. — Cassine-leaved Buckthorn.

The bark is reddish brown. The twigs are relatively stout, slightly hairy and dark gray. The leaves are numerous, rather thin, oblong-obovate or oblanceolate, 2 to 10 cm. long, rounded or notched at the apex, gradually tapering at the base, slightly revolute on the margin, dark green and smooth above, paler and prominently nerved beneath; the leaf-stalk is slender, 8 to 12 mm. long. The flowers are in many-flowered fascicles, opening in May; the pedicels are 2 to 5 mm. long, smooth and slightly enlarged toward the top; calyx-lobes orbicular, about 2 mm. long; corolla-lobes suborbicular, 1.5 to 2 mm. broad, often irregularly toothed, the

appendages lanceolate or ovate-lanceolate, crisp or toothed; staminodes ovate, about 2 mm. long, blunt and finely toothed. The subglobose fruit is black, 1 to 1.5 cm. long, ripening several weeks earlier than that of other species of the genus in the same region.

3. SHINING BUMELIA — *Bumelia lucida* Small

A small tree or shrub of Louisiana and eastern Texas, attaining a maximum height of 7 meters.

The branches are stiff and thorny. The twigs are stout and smooth, dark gray, with raised yellowish lenticels. The leathery leaves are elliptic to elliptic-ovate or elliptic-oblanceolate, 2 to 5 cm. long, sharp-pointed or blunt at each end, entire and revolute on the margin, deep green, smooth and shining above, paler, dull and prominently netted beneath; the leaf-stalk is slender, 2 to 5 mm. long. The flowers are borne in many-flowered fascicles on slender, smooth pedicels 3 to 7 mm. long; their calyx-lobes are suborbicular; corolla-lobes also suborbicular, appendages lanceolate and blunt; stami-



FIG. 709. — Shining Bumelia.

nodes ovate, 2 mm. long, blunt and sometimes unequal. The fruit is usually oval, 7 to 8 mm. long.

4. SOUTHERN BUCKTHORN — *Bumelia lycioides* (Linnæus) Gærtner

Sideroxylon lycioides Linnæus

A slightly armed small tree or shrub of damp soil along streams or swamps from Virginia and Illinois to Florida and Texas, becoming 9 meters tall, with a trunk diameter of 1.5 dm. It is also called Ironwood, Buckthorn, Carolina buckthorn, Southern Bumelia, and Chittimwood.

The trunk is usually short, its branches rather stout. The bark is thin, smooth or slightly broken into scales of a light reddish brown or grayish color. The twigs are smooth, round, somewhat shining, reddish brown to gray; the winter buds are very small and blunt. The abundant leaves are tardily deciduous, thick, almost leathery, oblong elliptic or rarely oblanceolate, 4 to 12 cm. long, bluntish to taper-pointed, rarely rounded at the apex, tapering at the base, pale green and prominently netted-veined on both surfaces; the leaf-stalks are slender, slightly grooved and from 5 to 12 mm. long. The flowers appear from June to August, in dense fascicles, on slender pedicels 7 to 10 mm. long; their calyx is smooth, its lobes oval or orbicular-ovate, 2 mm. long and blunt; corolla-lobes longer than broad, and blunt; appendages lanceolate or ovate-lanceolate, sharp-pointed; staminodes broadly ovate, 2 to 2.5 mm. long, minutely toothed, often keeled; ovary hairy at the base. The fruit is an oval berry, 1 to 2 cm. long, ripening in autumn.

The wood is hard, weak, close-grained, light brown or yellow; its specific gravity is about 0.75.

Texan Buckthorn, *Bumelia texana* Buckley, of the plains and mountains of southwestern Texas, is said to become a slightly thorny tree several meters tall.

The twigs are stout, round and nearly black. The leaves are thick and leathery, oval or oblong, 2 to 3 cm. long, rounded, truncate or notched at the apex, tapering or wedge-shaped at the base, scarcely revolute on the entire margin, pale green and smooth above, smooth or slightly hairy on the midrib and net-veined beneath; the leaf-stalk is slightly hairy, 5 to 10 mm. long. The flowers are in few-flowered fascicles on rather stout hairy pedicels, 1 to 3 mm. long, their calyx hairy. The fruit is an oblong or elliptic berry about 1 cm. long.



FIG. 710. — Southern Buckthorn.

5. ARIZONA BUCKTHORN — *Bumelia rigida* (A. Gray) Small*Bumelia lanuginosa rigida* A. Gray

A small tree occurring along streams from western Texas to Arizona and adjacent Mexico, reaching a maximum height of 7.5 meters.

The trunk is short, its branches are stiff, spreading and very spiny. The bark



FIG. 711. — Arizona Buckthorn.

is fissured into long, flaky red-brown ridges. The twigs are stout, rough and dark gray. The leaves are thick and leathery, varying from wedge-shaped to nearly oblong, 1.5 to 3 cm. long, rounded or notched at the apex, gradually or abruptly tapering at the base, somewhat revolute on the margin, dark green and smooth above, woolly beneath, the leaf-stalk 1 to 3 mm. long. The flowers are in rather few-flowered fascicles, on pedicels 4 to 8 mm. long; the calyx-lobes are suborbicular, 2 mm. long,

the corolla-lobes suborbicular, 2 mm. broad and irregularly toothed, the appendages lanceolate to ovate-lanceolate and sharp-pointed; staminodes ovate-lanceolate, irregularly toothed and blunt; stamens shorter than the corolla; ovary hairy. The fruit is oblong-oval or oval, 10 to 12 mm. long, black, often tipped with the persistent style.

The wood is hard, very close-grained, light brown, sometimes yellowish; its specific gravity is about 0.66.

6. WOOLLY BUCKTHORN — *Bumelia lanuginosa* (Michaux) Persoon*Sideroxylon lanuginosum* Michaux

This, the largest species of its genus, grows in sandy woods and thickets from southern Illinois and Kansas to Georgia, northern Florida and Texas; it reaches its greatest size, 20 meters tall, with a trunk diameter up to 1 m., in eastern Texas, but is usually much smaller and sometimes shrubby. It is also called Gum elastic, Black haw, Shittimwood, and Chittimwood.

The trunk is straight, its branches short, straight, and stiff. The bark is about 12 mm. thick, deeply fissured in both directions into scaly ridges of a dark grayish brown color. The twigs, covered with thick brownish wool at first, become nearly smooth; they are brown to gray and often bear stout, stiff,

straight or curved, reddish spines. The winter buds are about 3 mm. long, woolly, oblanceolate to elliptic, 5 to 10 cm. long. The leaves are mostly rounded or notched at the apex, gradually tapering to the base, brownish and woolly when unfolding, becoming smooth, dull dark green above, remaining more or less woolly beneath. The flowers are produced during the summer, in fascicles of 13 to 18 on densely hairy club-shaped pedicels 5 to 12 mm. long; the calyx is also densely hairy, its lobes suborbicular to broadly ovate, about 3 mm. long, blunt; corolla-lobes broadly ovate, 2 mm. long, the appendages ovate-lanceolate, sharp-pointed and shorter; staminodes ovate, sharp-pointed, usually toothed, about as long as the corolla-lobes; stamens shorter than the corolla. The fruit is oval to obovoid-oblong, 10 to 15 mm. long and black, its flesh thick.



FIG. 712. — Woolly Buckthorn.

The wood is weak, close-grained, brown or yellowish; its specific gravity is about 0.65. It is used to a slight extent in Texas for cabinet work. The coagulated juice from wounds of the freshly cut stem is used locally under the name of Gum elastic.

7. TOUGH BUCKTHORN — *Bumelia tenax* (Linnaeus) Willdenow

Sideroxylon tenax Linnaeus

Also called Tough bumelia, Black haw, and Ironwood, this small tree or shrub, attains a maximum height of 9 meters, with a trunk diameter of 1.5 dm. It inhabits sandy soils near the coast from North Carolina to half-way down the Florida peninsula.

The branches are straight, tough and spreading, with or without stout, straight, stiff spines, often 12 mm. long. The bark is thick, fissured into narrow scaly ridges of a reddish brown color. The twigs are covered with silky, often reddish hairs, which soon disappear, leaving them nearly smooth and dark red. The winter buds are very small, subglobose and covered with brown hairs. The numerous leaves are thin and firm, oblanceolate to spatulate or obovate, 2 to 7 cm. long, blunt or notched at the apex, wedge-shaped or tapering at the base, slightly revolute on the margin, thickly brownish hairy when unfolding, becoming smooth, dull green, with impressed midrib above, shining-silky with prominent midrib beneath; the leaf-stalk is 3 to 12 mm. long. The flowers appear in spring or early summer in dense axillary fascicles, on pedicels about 2 cm. long. The calyx is hairy, its lobes suborbicular, 1 to 1.5 mm. long, concave,



FIG. 713. — Tough Buckthorn.

entire or toothed, rounded or notched at the apex, corolla slightly longer than the calyx, its lobes 1.5 to 2 mm. long, broad and blunt, its appendages ovate or ovate-lanceolate, often irregularly toothed, shorter than the corolla-lobes and the ovate staminal nodes; stamens shorter than the corolla. The fruit drops off soon after ripening in the autumn; it is oblong or oblong-ovoid, 10 to 14 mm. long, black, often tipped with the slender, persistent style. Its wood is hard, dense and pale brown, with a specific gravity of about 0.73.

V. WILD DILLY

GENUS *MIMUSOPS* LINNÆUS

Species *Mimusops parvifolia* (Nuttall) Radlkofer

Achras Zapotilla parvifolia Nuttall. *Mimusops Sieberi* Chapman, not A. de Candolle



LSO called Wild sapodilla, this evergreen tree of peninsular Florida, the Keys, and the Bahamas, becomes 10 meters tall, with a trunk diameter of 4 dm., though usually much smaller and often shrubby.

The trunk is usually very short and widely branched, the branches stout, crooked, forming a round-headed tree. The bark is 6 mm. thick, with rounded ridges, which break into small plates of a gray or brown color. The twigs are thick, brownish hairy at first, soon becoming smooth, light brown and finally gray. The buds are ovoid, sharp-pointed and rusty hairy. The leaves are clustered at the end of the twigs, persistent, thick and leathery, oblong, 5 to 10 cm. long, notched at the apex, rounded or tapering at the base, somewhat revolute on the margin, slightly hairy when unfolding, soon becoming smooth, bright green and shining with impressed midrib above, paler, with prominent midrib, beneath; the leaf-stalk is



FIG. 714. — Wild Dilly.

12 to 25 mm. long, and grooved. The flowers open in spring or autumn, in clusters, on slender, hairy, drooping pedicels 1 to 3 cm. long; their calyx is hairy, about 6 mm. long, the 6 lobes lanceolate or ovate-lanceolate, sharp-pointed; the corolla is 1.5 to 2 cm. across, light greenish yellow, its 6 lobes spreading, linear-lanceolate, sharp-pointed, entire or but slightly toothed, the appendages petal-like but only half as long as the corolla-lobes; staminodes small, triangular; stamens shorter than the corolla; ovary hairy, tapering into the elongated, stigmatic tipped style. The fruit persists on the branches for some time; it is stout-stalked, depressed globose, about 3 cm. in diameter, brown and roughened, tipped by the thick, persistent style and subtended by the persistent calyx; its flesh is thick, spongy and milky juiced; seed usually 1, about 12 mm. long, bright brown and smooth.

The wood is hard, strong, close-grained and dark brown; its specific gravity is about 1.08.

The genus is a tropical one with probably 40 species of trees or shrubs, occurring in both hemispheres, several of which furnish edible fruits of sufficient importance in the tropics to be cultivated. The sweet, milky sap of several species is also used as food, and the concrete juice of one or more Central and South American species is known in commerce as Balata gum.

The name is Greek, having reference to the shape of the corolla. The generic type is *Mimusops Elengi* Linnæus of the Malay region.

VI. SAPODILLA

GENUS *SAPOTA* (PLUMIER) MILLER

Species *Sapota Achras* Miller

Achras Sapota Linnæus. *Sapota zapodilla* Coville



COMPACT evergreen tree with a milky juice, native of the West Indies or Central America and cultivated throughout the tropics for its fruit. It has long been cultivated in peninsular Florida where it has become naturalized in some places, reaching a height of 12 meters. It is variously known as Sapotilla plum, Nisberry, Neesberry, Naseberry, Nispero, Chico, White sapotilla, and Bully tree.

The trunk is straight, the bark dark brown, the spreading branches forming a round-topped tree. The twigs are stout, rough and brown or gray. The leaves, usually clustered near the tips of the twigs, are thick and leathery, alternate, elliptic-oblong, pointed or blunt, narrowed or wedge-shaped at base, entire and slightly thickened on the margin, dark green, smooth and shining above, duller, smooth, with prominent yellowish midrib beneath; the petiole is slender, hairy, 0.5 to 2 cm. long. The flowers are on brownish, downy stalks, solitary in the axils of the leaves; the calyx is covered with rusty-brown down, the 6 lobes ovate, blunt, in 2 series; corolla 6-lobed, whitish, scarcely longer than the calyx; appendages longer than the stamens; anthers arrow-shaped; ovary obovoid, brown, downy; style

exserted, tapering to a stigmatic point. The fruit is a globose to ovoid fleshy berry, 3 to 8 cm. in diameter, its surface rough and rusty brown; flesh brownish, sweet, with a milky juice. There are 4 or 5 large seeds, which in cross-section of fruit give the appearance of a star; these are flattened, ovate, about 1.5 cm. long, dark brown or black and shining, with a long, whitish scar on the inner edge; endosperm copious and white.

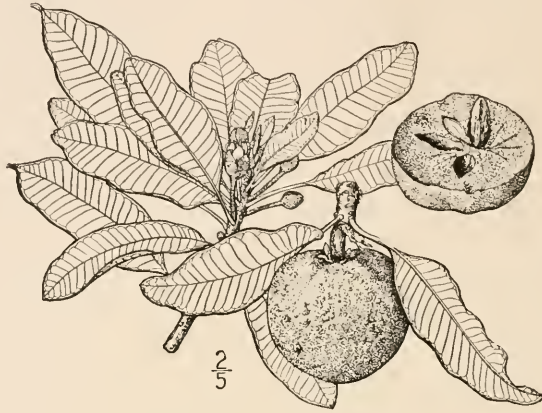


FIG. 715. — Sapodilla.

The genus contains only this species; the name is derived from the West Indian name of the fruit.

The wood of the Sapodilla is very hard and strong, close-grained, light red with darker stripes; its specific gravity is about 1.02. The fruit is highly esteemed in the tropics. This tree is the source of Gum chicle, which is made by evaporating the sap of the tree or the juice of the fruit.

EBONY FAMILY

EBENACEÆ Ventenat



THE Ebony Family is composed of some 275 species of trees and shrubs, grouped into 6 or 7 genera; they are widely distributed in tropical regions, a few only occurring in the temperate zones. Their wood is very hard, often susceptible of a high polish; the bark is astringent.

The alternate simple entire-margined leaves are stalked but without stipules; the flowers are mostly diœcious, borne solitary or in cymes; the 3-lobed to 7-lobed persistent calyx is inferior, free from the ovary, enlarging with the fruit; the gamopetalous corolla has from 3 to 7 lobes; the stamens are from twice as many to four times as many as the corolla-lobes in the sterile flowers, adnate to the corolla-tube, their filaments short, their anthers introrse; the fertile flowers have a several-celled ovary with from 1 to 3 ovules in each cavity, 2 to 8 styles, somewhat united at the base or separate, and simple or 2-cleft stigmas, also usually some imperfect stamens. The fruit is a berry, containing several seeds, or only one; seed with much endosperm. Our genera are:

Styles distinct; filaments hairy; anthers opening lengthwise; pistillate flowers with staminodes.

1. *Diospyros*.

Styles united; filaments smooth; anthers opening near the top; pistillate flowers without staminodes.

2. *Brayodendron*.

I. PERSIMMON

GENUS **DIOSPYROS** LINNÆUS

Species ***Diospyros virginiana*** Linnaeus



DIOSPYROS, of which *D. Lotus* Linnaeus, of temperate Asia, is the type (Greek, Zeus-wheat), comprises 160 species or more, mostly trees, more abundant in tropical Asia than anywhere else. Our Persimmon, known also as Simmon-tree, Date-plum, and Possum-wood, is its only North American representative. It grows in woods, preferring dry soil, from Rhode Island to southern New York, Iowa, Kansas, Florida,



FIG. 716. — Persimmon.

and Texas, reaching a maximum height of about 35 meters, but even with this great height its trunk is seldom more than a meter thick; its branching is very irregular.

The thick hard bark is dark brown or black, irregularly fissured into small blocks; the young twigs are reddish brown and somewhat hairy, becoming smooth after the first season; the winter buds are ovoid, pointed, with numerous purplish shining scales. The leaves are hairy when young, but become smooth when old; they vary from 8 to 16 cm. in length, are ovate or oval, pointed, strongly pinnately



FIG. 717. — Persimmon Trees, Trenton, N. J.

veined, varying at the base from narrowed to somewhat heart-shaped, the upper surface dark green, the under surface pale; their stalks are from 8 to 20 mm. long, and separate readily from the twigs in drying. The flowers are yellowish green and dioecious, the sterile on one tree, the fertile fruit-forming ones on another, the former usually in small clusters, the latter usually solitary. Both kinds of flowers have usually 4-lobed corollas; the fertile flowers have a pointed ovary, hairy toward the top, surmounted by 4 slender styles, and mostly 8, short sterile

or sometimes pollen-bearing anthers; the staminate flowers have the corolla constricted above the middle and usually 16 stamens with short filaments and narrow anthers. The fruit is an orange-colored, reddish yellow or purplish drupe, varying from oblong to broader than long, 2 to 4 cm. in diameter, very pulpy, seated in the leathery 4-lobed calyx; it is astringent when green, sweet when ripe.

The hard strong wood is dark brown; its specific gravity is about 0.79. It is a favorite wood for the manufacture of shoe-last.

II. BLACK PERSIMMON

GENUS **BRAYODENDRON** SMALL

Species **Brayodendron texanum** (Scheele) Small

Diospyros texana Scheele



DENSELY branched tree or shrub growing in moist, rich soil of river valleys in Texas and adjacent Mexico, reaching a height of 16 m., with a trunk diameter up to 6 dm.; it is also called Mexican persimmon and Chapote.

The bark is thin and smooth, light reddish gray, the outer layers peeling off. The twigs are round, stiff, without terminal buds, reddish hairy, becoming smooth



FIG. 718. — Black Persimmon.

and finally brown. The tardily deciduous leaves are thick and leathery, oblanceolate or obovate, 1 to 5 cm. long, blunt or shallowly notched at the apex, wedge-shaped at the base, entire-margined, dark green and shining above, paler and hairy and prominently veined beneath, without a stalk. The flowers, appearing from March to May, are dioecious, in clusters of 2 or 3, or solitary, on branchlets

of the previous season. The staminate flowers are on nodding hairy pedicels, usually in clusters of 2 or 3; the calyx is about 3 mm. long, deeply 5-lobed, and silky; the corolla is urn-shaped, twice the length of the calyx, white, scarcely 5-lobed; the 16 stamens are distinct, in 2 rows; the anthers are linear-lanceolate, and open at the apex; the pistillate flowers are usually solitary on shorter pedicels, their calyx silky, half the length of the hairy corolla, which is nearly 12 mm. across; ovary ovoid, 8-celled, with 1 ovule in each cavity, and 4 spreading, 2-lobed styles; there are no stamens nor staminodia. The fruit ripens in August; it is a depressed globose berry, 2 cm. in diameter, black and tipped by the style and subtended by the enlarged, reflexed calyx-lobes; the skin is thick, the pulp sweet, dark colored, and contains 3 to 8 triangular seeds, 8 mm. long, light red, and shining.

The wood is hard, very compact, nearly black, with a specific gravity of about 0.85. It is used for tool handles and other turned ware. The fruit is very astringent unless fully ripe, but stains everything it comes in contact with by its black juice; it is said to be used as a black dye by the Mexicans.

The genus seems to be monotypic and is named in honor of Professor William L. Bray, a diligent student of the Texan flora.

THE SWEET LEAF FAMILY

SYMPLOCACEÆ Miers



HIS family consists of about 275 species of trees or shrubs all classified under the one genus *Symplocos*; they occur in the warmer regions of America, Asia, and Australia; in Europe some tertiary fossils have been referred to it. They are of little economic value, but some are used locally to produce a yellow dye and also in medicine on account of supposed tonic properties.

The Symplocaceæ have alternate, simple, usually leathery leaves with entire or toothed margins and a preponderance of yellow pigment; there are no stipules. The flowers are perfect, or often polygamo-diœcious, mostly yellow, disposed in lateral or axillary clusters, usually spicate or racemose. The calyx is superior, cup-shaped, 5-lobed; the corolla is 5-parted nearly to the base; stamens numerous, joined to the corolla-tube, in several series, their filaments more or less united at the base; anthers short, introrse; ovary 2- to 5-celled with 2 or rarely 4 ovules in each cell; style simple, terminal, the stigma entire or slightly lobed. The fruit is a berry or drupe, its stone hard and bony, usually 1-seeded; embryo straight or curved in fleshy endosperm.

SWEET LEAF

GENUS *SYMPLOCOS* JACQUIN

Species *Symplocos tinctoria* (Linnæus) L'Héritier

Hopea tinctoria Linnæus



HIS small tree or shrub is evergreen in the warmer sections of its range, but its leaves are deciduous toward its northern limit and at higher altitudes. It occurs from southern Delaware to northern Florida, westward to Louisiana and Arkansas, in moist, rich woods or borders of swamps. Its maximum height is 10 meters, with a trunk diameter of 3 dm.; it is also called Yellowwood, Horse sugar, Wild laurel, and Florida laurel.

The branches are slender and ascending. The bark is 8 to 12 mm. thick, close or sometimes fissured and of a reddish gray color. The twigs are stout, round and pithy, light green and thickly hairy, becoming quite smooth and glaucous and finally dark brown; winter buds ovoid, sharp-pointed. The leaves are somewhat leathery, elliptic, oblong or oblong-lanceolate, 6 to 15 cm. long, sharp or taper-pointed, narrowed at the base into a short stalk, shallowly toothed on the margin, hairy at first, becoming shining above, paler and yellowish hairy, with

the midrib prominent beneath. The fragrant flowers, which appear from March to June, according to situation, are in nearly sessile, 5- to 10-flowered clusters, enclosed in the bud by hairy fringed, orange-colored scales. The calyx is 2 to 2.5 mm. high, dark green, hairy and minutely 5-toothed; the corolla is light yellow, 6 to 8 mm. long, the 5 petals slightly united at the base, obovate or obovate-spatulate, rounded at the apex; stamens many, their filaments united at the base into 5 clusters; anthers orange-colored and exserted; ovary 3-celled, glandular, style slender, club-shaped, exserted. The fruit is a drupe, oblong or ovoid, 10 to 14 mm. long, smooth and crowned by the persistent calyx-lobes and base of the style; the flesh is thin and dryish; the stone containing a single ovoid pointed seed.



FIG. 719. — Sweet Leaf.

The wood is soft, close-grained, reddish brown; its specific gravity is about 0.52. The leaves are eagerly eaten by cattle, especially in the autumn; the leaves and bark yield a yellow dye.

The generic name is Greek, in reference to the united filaments of some of the species. The Japanese shrubby species, *Symplocos cratægoides* Buchanan, is sparingly planted in America and Europe on account of its ornamental, bright bluish, fleshy fruits; *S. martinicensis* Jacquin of the West Indies is the type of the genus.

THE STORAX FAMILY

STYRACACEÆ A. de Candolle



HIS family comprises about 7 genera, including about 75 species of trees or shrubs, mostly tropical. They are of minor economic importance on account of the balsams, rich in benzoic acid, produced by some of them. Storax, a liquid balsam, is obtained from the inner bark of *Styrax officinale* Linnæus of the Mediterranean region, and Benzoin, a solid one, is obtained from *Styrax Benzoin* Dryander, of the Malay region. Many of the species are very ornamental and are frequently planted in parks and on lawns.

The Styracaceæ have alternate, simple leaves without stipules. The flowers are perfect, regular, arranged in racemes, cymes or fascicles. The calyx is wholly or partly joined to the ovary, 5-lobed, sometimes 4- to 8-lobed; the corolla is of 5, rarely 4 to 8, petals, usually little united; the stamens are twice the number of the corolla divisions or sometimes more, joined in one series to the corolla-tube, their filaments flattened and somewhat united at the base; anthers introrse; the ovary is partly superior, 2- to 5-celled, each cell containing 1 or few ovules; the style is simple and slender; stigma simple or 2- to 5-lobed. The fruit is a drupe or capsule, usually 1-seeded; the endosperm of the seed is fleshy or horny, the embryo straight.

Two genera occur in our area, *Styrax*, represented by four shrubby species, and the following.

THE SILVERBELLS

GENUS **HALESIA** ELLIS

Mohrodendron Britton



HE genus *Halesia* comprises only 3 species, peculiar to the southeastern United States, 2 of which are trees; the third is a shrub with small flowers and fruit. They are of no economic value except for ornamental purposes.

They have alternate, deciduous leaves. The flowers are in lateral, usually drooping racemes; the calyx is joined to the ovary, 4- or 5-ribbed, and lobed; the corolla is bell-shaped, 4- or 5-lobed, large, white and showy; the usually 8 or 16 stamens are in one series, slightly joined to the corolla, anthers elongated; the ovary is inferior, 2- or 4-celled, the style elongated and tipped by a minute stigma; ovules 4 in each cavity. The fruit is elongated, nut-like, dry, tipped with

the small calyx-lobes and style, 2- or 4-winged; the thick, angular, elongated stone is 1- to 4-celled, containing 1 seed in each cavity; seeds with a thin, shining, brown coat; the endosperm is copious and fleshy, the embryo round; cotyledons oblong.

Halesia was named in 1759 in honor of Stephen Hales (1677-1761), a distinguished English scientist. In 1756, Patrick Browne named a Jamaica tree *Halesia*, but as he indicated no type species, his name is invalid, and does not interfere with the use of *Halesia* for the Silverbells.

Fruit 2-winged; corolla deeply parted, hairy without.

1. *H. diptera*.

Fruit 4-winged; corolla slightly lobed, smooth.

2. *H. carolina*.

1. SNOWDROP TREE — *Halesia diptera* Ellis

Mohrodendron dipterum Britton

Known also as Southern silverbell tree and Cow licks, this is a small, widely branched tree, or more often a shrub, of wet woods and swamp-borders in the coastal plain regions from South Carolina to Texas and up the Mississippi valley to Arkansas, attaining a maximum height of about 15 meters, with a trunk diameter of 3 dm.



FIG. 720. — Snowdrop Tree.

The bark is from 8 to 12 mm. thick, ridged, and peels off into thin scales of a reddish brown color. The twigs are light green, more or less hairy, soon becoming smooth and finally dark red-brown. The winter buds are axillary, very small, hairy, ovoid and blunt; there is no terminal bud. The leaves are rather thin, ovate to obovate, taper-pointed, narrowed or rounded at the base, toothed on the margin, light green and smooth except above, along the narrow midrib, softly hairy beneath; leaf-stalk 1 to 2 cm. long. The flowers appear in March or April at the south, but later in cultivation

northward, in clusters, on slender, hairy pedicels about 4 cm. long, on twigs of the previous season; the calyx is obpyramidal, 6 to 7 mm. long, densely hairy, the lobes triangular and sharp-pointed; the corolla is white and showy, bell-shaped, 2 to 3 cm. long, divided nearly to the base into oblong or oblong-obovate lobes, which are blunt or notched at the apex, and very hairy; stamens 8, or sometimes as many as 16, included; filaments and style hairy, the latter slender; ovary 2-celled, sometimes 4-celled. The fruit is oblong or elliptic, 4 to 5 cm. long, broadly 2-winged, occasionally with 2 small additional wings; the stone is narrowly obovoid, conspicuously 8-ribbed.

The wood is soft, strong, dense and light brown, its specific gravity about 0.57.

This very elegant plant with graceful branches and showy white flowers, makes a most desirable object for southern gardens; it is hardy as far north as southeastern Pennsylvania.

2. SILVERBELL TREE — *Halesia carolina* Linnæus

Halesia tetraptera Linnæus. *Mohrodendron carolinum* Britton

This very beautiful small tree or shrub is also known as the Snowdrop tree, Wild olive tree, Bell tree, Opossumwood, Calicowood, Tisswood, Peawood, and Rattle box. It occurs from West Virginia, to southern Illinois, and Arkansas, southward to central Florida, and eastern Texas, attaining its greatest dimensions of about 27 meters high, with a trunk diameter of 1 m. in the mountains of North Carolina and Tennessee.

The branches are stout and ascending. The bark is about 12 mm. thick, with rounded ridges, which separate into thin scales of a red-brown color. The twigs are slender, thickly hairy at first, soon becoming smooth or nearly so, and grayish brown. The leaves are thin and firm, oblong, oval or ovate, 5 to 17 cm. long, taper-pointed, narrowed or rounded at the base, finely toothed on the margin, hairy at first, soon becoming smooth except on the nerves, bright green above, paler and more or less hairy beneath, becoming bright yellow in autumn; the leaf-stalk is 1 to 2 cm. long. The flowers open from March to May, dependent upon location; they are in clusters or few-flowered racemes on the branches of the previous season, on slender, smooth, drooping pedicels 2.5 to 5 cm. long; the calyx is 5 to 6 mm. long, smooth, its spreading lobes triangular and sharp-pointed; the corolla is bell-shaped, 2 to 2.5 cm. long, the lobes smooth, rounded, shorter than the tube; the 10 to 16 stamens, like the style, are smooth and slender; the ovary is 4-celled. The fruit remains upon the branches far into the winter, it is oblong or oblong-obovoid, 4 to 5 cm. long, 4-winged, tipped by the persistent style, its stone obovoid, slightly ridged.

The wood is soft, close-grained, and brown; its specific gravity is about 0.56. It is said to be sawed and sometimes sold for Cherry. In cultivation this is a most striking object when in flower, and is often seen in parks and on lawns from Massachusetts southward.



FIG. 721. — Silverbell Tree.

THE OLIVE FAMILY

OLEACEÆ Lindley



HIS family embraces about 21 genera containing some 500 species of trees or shrubs, with a few nearly herbaceous plants. They are of wide distribution in both temperate and tropic regions, but most abundant in the northern hemisphere and are of considerable economic value, the most important being the Olive, *Olea europaea* Linnæus, whose fruit, and the fixed oil expressed from it, are almost universal foods. The various Ashes are of great value on account of their superior timber. Many ornamental plants of this family have a well-deserved reputation in our gardens; commonest among these are the Lilacs, various species of *Syringa* from Europe and Asia, the Goldenbells, species of *Forsythia* from Japan, the Privets, various species of *Ligustrum* from Europe and Asia, and our own southern Fringe tree.

The Oleaceæ have opposite, rarely alternate, simple or compound leaves without stipules. The flowers are clustered in cymes or fascicles; they are perfect, diœcious or polygamous, mostly regular; the calyx is inferior, usually small and 4-parted, sometimes wanting; the corolla consists of 2 to 6 elongated, imbricated or valvate, partly united petals, or sometimes none; stamens 2 to 4, adnate to the base of the corolla, their filaments separate, distinct, usually short; the ovary is free, 2-celled, each cell usually containing 2 ovules; styles short or none; stigma capitate or 2-lobed. The fruit is a 2-valved capsule, a samara, berry or drupe, the seed usually solitary; endosperm fleshy, bony or none; embryo straight, rather large. Our arborescent genera are:

Fruit a dry samara; leaves compound.

1. *Fraxinus*.

Fruit a fleshy berry.

Flowers very small, mainly polygamo-diœcious, usually without corolla, or this if present very small; style slender.

2. *Forestiera*.

Flowers perfect, or polygamous; corolla present; style short or stout.

Leaves deciduous; flowers large; petals long, nearly distinct.

3. *Chionanthus*.

Leaves evergreen; flowers small; petals short.

4. *Osmanthus*.

1. THE ASHES

GENUS **FRAXINUS** [TOURNEFORT] LINNÆUS

THE Ash of southern Europe, *Fraxinus excelsior* Linnæus, the generic type, was known to the Greeks under the generic name adopted by Linnæus. About 40 species are now known, distributed throughout the north temperate zone, extending into Cuba (*Fraxinus cubensis* Grisebach) and to southern Mexico (*Fraxinus Schiedeana* Chamisso and Schlechtendahl).

Nearly all the kinds are trees, and form an important element in our forests; but *Fraxinus dipetala* Hooker and Arnott of California is usually if not always a shrub, and some of the other species are occasionally shrubby in habit. Many of our native species are planted for shade trees; also the European *Fraxinus elatior* Linnæus, which is occasionally spontaneous by seed.

The sap of the ash trees is watery, the wood tough, and in most kinds strong. The leaves are opposite, and in most species pinnately compound with 3 to 11 leaflets, though *Fraxinus anomala* Torrey, of Colorado and Utah usually has but one leaflet; they are without stipules, and in all species fall away at the close of the growing season. The clustered (panicled) flowers are small and regular, appearing early in the spring; they are mostly imperfect, however, and in the majority of American species are without petals, but in the Manna-ash of southern Europe, several Asiatic species, and 3 of western North America there are either 2 or 4 long narrow petals, making the trees conspicuous when in flower, the bloom somewhat resembling that of the Fringe-tree (*Chionanthus*), which is a close relative of the Ashes; the calyx is 4-toothed or 4-lobed, or in some species wanting; there are almost always only 2 (rarely 3 or 4) stamens in the staminate flowers, their anthers opening by longitudinal slits; the pistillate flowers have a single 2-celled (rarely 3-celled or 4-celled) ovary, borne above the calyx, when this is present, surmounted by a 2-cleft style; each ovary-cell has 2 ovules, usually only 1 of them maturing into a seed. The fruit is winged at the top or all around the seed-bearing part.

1. Petioles and leaf-rachis not wing-margined; leaflets large.

A. Flowers apetalous.

Leaflets usually only one, rarely 2 to 5.

1. *F. anomala*.

Leaflets 3 to 11.

Lateral leaflets sessile, or very short-stalked.

Samara winged all around; eastern tree.

2. *F. nigra*.

Samara-wing decurrent on the seed-body.

Leaves coriaceous; western trees.

Seed-body of the samara slightly compressed; Pacific coast tree.

3. *F. oregona*.

Seed-body of the samara round; southwestern tree.

4. *F. velutina*.

Leaves thin; tree of central North America.

5. *F. campestris*.

Lateral leaflets distinctly stalked.

Body of the samara flat, the wing extending all around it.

- Twigs 4-sided; leaflets 7 to 11; samara rounded or obtuse at the base. 6. *F. quadrangulata*.
- Twigs round; leaflets 5 to 7; samara narrowed or acute at the base.
- Samara spatulate to oblong-spatulate. 7. *F. pauciflora*.
- Samara elliptic to ovate or obovate. 8. *F. caroliniana*.
- Body of the samara round or nearly so, the wing decurrent upon it.
- Wing of the samara decurrent on the body to the middle or below.
- Wing of the samara long-linear. 9. *F. Darlingtonii*.
- Wing of the samara spatulate or oblong-spatulate.
- Leaflets all cuneate at the base; western trees.
- Leaflets dark green, shining; samaras 3 to 4 cm. long. 10. *F. Berlandieri*.
- Leaflets yellow-green, dull. 11. *F. Toumeyii*.
- Lateral leaflets not cuneate at the base.
- Samara-body round.
- Samara-body long-linear; eastern trees.
- Samara broadly spatulate; leaves thick, entire. 12. *F. Michauxii*.
- Samara narrowly spatulate; leaves thin, serrate or entire. 13. *F. pennsylvanica*.†
- Samara-body plump, oblong. 14. *F. Smallii*.
- Samara-body compressed.
- Samara 7 to 8 cm. long; leaves entire; southern tree. 15. *F. profunda*.
- Samara 3 to 4 cm. long; leaves serrate; southwestern tree. 16. *F. coriacea*.
- Wing of the samara terminal or very nearly so, scarcely decurrent on the seed-body.
- Twigs and leaves glabrous; or leaves pubescent.
- Leaflets obtuse or short-pointed. 17. *F. texensis*.
- Leaflets acute or acuminate. 18. *F. americana*.‡
- Twigs and leaves densely pubescent. 19. *F. biltmoreana*.
- B. Flowers with a 4-parted or 2-petaled corolla; western trees and shrubs.
- Corolla deeply 4-parted into linear petals. 20. *F. cuspidata*.
- Corolla of 2 oblong or oblong-obovate petals. 21. *F. dipetala*.
2. Petioles and leaf-rachis wing-margined; leaflets spatulate to oblong-obovate, 2.5 cm. long or less. 22. *F. Greggii*.

1. ANOMALOUS ASH — *Fraxinus anomala* Torrey

This small tree differs from all other American species in usually having leaves with but a single leaflet, and this circumstance gave the tree its specific name; occasionally, however, there are from 2 to 5 leaflets. It occurs from west-central Colorado across southern Utah to southern Nevada, and is thus rather narrowly restricted in range. It attains a height of only 7 meters or less, and a trunk diameter of about 1.5 dm., sometimes, indeed, growing as a shrub.

The bark is dark brown and fissured, 6 to 8 mm. thick; the young twigs are rather sharply 4-angled, and finely hairy, the older ones gray, round and smooth; the usually solitary leaflet is at first hairy, but becomes smooth, is slender-stalked

and ovate to rotund or sometimes wider than long, and blunt or acutish; when there are 2 leaflets or more to the leaves they are usually sharper-pointed; the flowers are borne in clusters at the scars of leaves of the preceding year and both perfect and imperfect ones often occur in the same cluster; the calyx has four very small teeth; the samara is oblong, or often broader above the middle than below, 1.5 to 2 cm. long, 1 cm. wide or less, the blunt or notched wing extending all around the flat striated seed-bearing part.



FIG. 722. — Anomalous Ash.

The wood is hard, brown; its specific gravity about 0.66. On account of its small size and limited range the tree is of no considerable economic importance.

2. BLACK ASH — *Fraxinus nigra* Marshall

Fraxinus sambucifolia Lambert

Swamps and river shores are the favorite habitats of the Black ash, which grows naturally in such situations from Newfoundland through Canada to Manitoba, thus ranging farther north than other species, and reaches its southern limits in Virginia, southern Illinois, Missouri, and Arkansas. Under favorable conditions it becomes about 30 meters high, with a trunk 5 dm. thick.



FIG. 723. — Black Ash.

The bark is thin, gray and scaly. The twigs are round from the first, minutely hairy when very young, but soon become quite smooth. The leaflets vary from 7 to 11, are sessile on the leaf-axis, except the end one, which is stalked, and are oblong-lanceolate, long-pointed, dark green above, bright green beneath and rather finely toothed; they usually have some reddish brown hairs along the midrib on the under

side. The flower clusters are borne on the branchlets at the scars of leaves of the preceding year; the flowers are dioecious or polygamous, without calyx or

petals. The samaras are oblong to linear-oblong, or sometimes broader above than below the middle, 2.5 to 5 cm. long, strongly striated longitudinally, the usually notched wing extending all around the seed-bearing part and about twice its length.

Except in swampy ground the Black ash grows slowly. Its wood is coarse-grained and tough but not strong, dark brown in color, with a specific gravity of 0.63. It is much used for fences, being durable in the soil, and in basket-making, cabinet-work and interior carpentry.

3. OREGON ASH — *Fraxinus oregona* Nuttall

The Oregon ash inhabits the region from southern British Columbia to southern California, preferring rich soil in valleys, and sometimes becomes 25 meters high, with a trunk 1.3 meters in diameter.

The bark is gray-brown and fissured, 2 to 4 cm. thick. The young twigs and leaves are usually densely velvety, but often lose this character as they grow older, or are sometimes nearly smooth from the first. The leaves have 5, 7 or rarely 9 leaflets, which are ovate to elliptic, sessile or rarely short-stalked, 2.5 to 7.5 cm. long, blunt or sharp-pointed, and are usually without teeth, though the margins are sometimes a little scalloped. The flower clusters are borne at the leaf scars of the preceding year, and the staminate and pistillate flowers are usually, if not always, on different trees; the staminate flower has a very small 4-toothed calyx and 2 stamens with anthers rather shorter than those of the eastern Ashes; the pistillate calyx is



FIG. 724. — Oregon Ash.

larger and its 4 teeth are incised. The samara is 5 cm. long or less, spatulate to nearly linear, the blunt wing decurrent on the somewhat flattened seed-bearing part to or below the middle.

It is a tree of rapid growth and is much used for street and park planting on the Pacific coast; it is hardy in the eastern and middle States. The wood has a specific gravity of 0.57, is brown and rather brittle, and is employed in the manufacture of wagons, barrels and in interior carpentry.

4. VELVETY ASH — *Fraxinus velutina* Torrey

This tree is recorded from western Texas to Arizona, southeastern California, and northern Mexico, preferring cañons.

The bark is reddish green and rough. The young twigs are round and either velvety or smooth, the older ones gray and smooth. The leaves are also velvety or at least somewhat hairy on the lower surface, with 3 to 9 lanceolate to ovate, or elliptic leaflets, which are blunt or sharp-pointed, often toothed, leathery in texture and yellowish green, 2.5 to 8 cm. long, rather strongly netted-veined, the lateral ones sessile or nearly so on the leaf-axis. The staminate and pistillate flowers are borne on different trees, the clusters appearing at the leaf scars of the preceding year. The calyx of the pistillate flowers is larger than that of the staminate, and its 4 lobes are slightly toothed. The samara is spatulate to linear-spatulate, 2.5 to 3.5 cm. long, the blunt or slightly notched wing as long as the terete seed-bearing part or longer, and decurrent upon it only for about one fourth its length.

Dr. Torrey changed the specific name of this tree subsequently to *Fraxinus pistaciæfolia*, because he thought *velutina* uncharacteristic; the species has long been confounded with Toumey's ash.



FIG. 725. — Velvety Ash.

5. PRAIRIE ASH

Fraxinus campestris Britton, new species

This tree, which ranges from Montana to Manitoba, Wyoming and Kansas, preferably inhabiting valleys, has been confused with the eastern Red ash (*Fraxinus pennsylvanica* Marshall), from which it differs in its shorter-stalked or sessile lateral leaflets which are relatively broader, and in its shorter fruit.

Its bark is thick, brown and rough. The young twigs are round and either smooth or velvety. The leaves have 7 leaflets for the most part, which are ovate to



FIG. 726. — Prairie Ash.

ovate-lanceolate, usually long-pointed and toothed and more or less hairy beneath, rarely smooth on both surfaces. The flowers are diœcious, with a small 4-toothed

calyx. The samaras are spatulate, averaging about 3 cm. long, the blunt or little notched wing decurrent upon the narrowly conic seed-bearing part to its middle or below.

The wood is similar to that of the Red ash, and is used for similar purposes. The type specimen was collected by Rev. J. M. Bates at Long Pine, Nebraska, Aug. 9, 1897.

6. BLUE ASH—*Fraxinus quadrangulata* Michaux

This, the most slender of the North American Ashes, inhabits preferably hill-sides and river valleys and grows naturally from southern Ontario and Minnesota southward to east Tennessee, Alabama, and Arkansas. It reaches a maximum height of about 38 meters, thus rivaling the White ash, but its trunk is not more than 1 meter thick.



FIG. 727. — Blue Ash.

Its gray bark is 1 to 2 cm. thick, and splits up into large scales. The young twigs are 4-sided, whence the specific name, and at first, like the leaf-buds, reddish velvety, but soon become smooth. All the 7 to 11 leaflets are stalked, hairy when they first unfold, and smooth, or somewhat hairy along the veins of the under side when older; they are pointed and serrate with low teeth, and yellowish green. The flowers appear before the leaves in the spring, and differ from those of most other species in being perfect, that is, there are stamens and a pistil in each flower; the calyx is minute and not

toothed, and the 2 purple stamens are almost without filaments. The samaras are oblong to somewhat wedge-shaped, 2.5 to 4 cm. long, 1 cm. wide or less, the thin blunt or notched wing decurrent on the margins of the flat striated fruit body to its base, and about twice its length.

The Blue ash is usually a healthy tree, and well adapted to planting; its wood is light brownish yellow and hard, with a specific gravity of 0.72, and is much used in general construction and in wagon making.

7. SOUTHERN WATER ASH — *Fraxinus pauciflora* Nuttall

Though greatly resembling the Water ash (*Fraxinus caroliniana* Miller), this wholly southern tree appears to be readily distinguished from that species by the form of its fruit. It grows in swamps and lagoons from southern Georgia to central

Florida, and also in Cuba, if the very similar *Fraxinus cubensis* of Grisebach proves to be the same species, and perhaps also in Louisiana.

The bark is gray and scaly, the branchlets light gray, round and smooth. The 5 or 7 ovate to oblong-lanceolate leaflets are all stalked, somewhat toothed or entire-margined, and usually rather long-pointed. The flowers are diœcious. The samaras are spatulate, the rather firm wing rounded or notched at the top, about twice as long as the seed-bearing part and decurrent along it as a narrow margin to its base or just above.

The wood is light, weak, and of no commercial value. The tree has been redescribed and illustrated by Professor Sargent as *Fraxinus floridana*.



FIG. 728. — Southern Water Ash.

8. WATER ASH — *Fraxinus caroliniana* Miller

The Water ash grows in lagoons and swamps from southeastern Virginia to Florida in the Atlantic coastal plain, and extends westward through the Gulf States to Texas and southern Arkansas. It is seldom more than 12 meters high and the trunk not more than 3 dm. thick.

The bark is light gray, and only 3 or 4 mm. in thickness, peeling off in scales.



FIG. 729. — Water Ash.

The young twigs are round, and slightly reddish hairy, but they early become smooth and gray. The leaves are somewhat hairy when they first unfold, but become nearly or quite smooth, or sometimes remain hairy on the under side; they have 5, 7 or rarely 9, oblong, ovate or oblong-lanceolate leaflets, which are either toothed or entire-margined, pointed, or rather blunt, distinctly stalked and 5 to 15 cm. long. The clusters of flowers appear early in the spring at the leaf scars of the previous year; the staminate and pistillate flowers are borne on different trees, the former with a very minute calyx, the latter with a rather large and sharply 4-toothed calyx. The samaras are elliptic to ovate or obovate, usually sharp-pointed, 3.5 to

5 cm. long, 2 cm. wide or less, the large veined wing extending all around the

seed-bearing part. In this tree the ovary is often 3-celled, giving rise to a 3-winged fruit.

Its wood is soft and weak, nearly white, and has no commercial value; its specific gravity is only 0.35.

9. DARLINGTON'S ASH — *Fraxinus Darlingtonii* Britton

This tree resembles the Red ash (*Fraxinus pennsylvanica* Marshall) in form, size and foliage, and has been confused with it, but it differs in the form of the fruit. It is known to occur on hill-sides, river-banks, and in valleys and swampy woods from Massachusetts to central New York and southward to Alabama and Louisiana, reaching a maximum height of about 20 meters. Its geographic range is probably wider than is yet known.

The young twigs and leaves are either velvety or quite smooth, and the former sometimes remain permanently velvety to the close of the growing season, the latter being either hairy beneath when old, or smooth. There are 5 or 7 lanceolate long-pointed



FIG. 730. — Darlington's Ash.

stalked leaflets. The flowers are diœcious. The samaras are long-linear, not spatulate, 5 to 7.5 cm. long, about 4 mm. wide, the narrow wing decurrent upon the terete seed-bearing part only to above the middle.

The wood is brown, hard and strong, and is used for the same purposes as that of the tree with which it has been confused.

10. BERLANDIER'S ASH *Fraxinus Berlandieri* de Candolle

Berlandier's ash inhabits southwestern Texas and adjacent northern Mexico; it sometimes becomes 10 to 12 meters high, and then has a trunk diameter of about 3 dm., but is not known to form a large tree.



FIG. 731. — Berlandier's Ash.

It has a gray, fissured bark, 4 cm. thick or less, and round twigs, which are smooth from the first, but the bud-scales are finely hairy. The leaves are either quite smooth or a little rusty-hairy along the veins on the under side; they have either 3 or 5 stalked, rather thick leaflets, which are lanceolate to oblong, or the end one obovate, pointed, wedge-shaped at the base, the upper surface dark green and shining, the lower surface bright green. The flowers are dioecious, the staminate ones with a very small calyx, the pistillate calyx much larger and sharply toothed. The samaras are spatulate-oblong, 3 to 4 cm. long, 5 to 7 mm. wide, the firm blunt or rather sharp-pointed wing about twice as long as the narrow somewhat flattened seed-bearing part, decurrent on its edges to much below the middle.

The wood is light brown with a specific gravity of 0.58. It is said to be planted as a street tree in many parts of Mexico.

II. TOUMEY'S ASH — *Fraxinus Toumeyi* Britton, new species

Toumey's ash inhabits cañons and river valleys from western Texas to New Mexico and southern California, extending into Sonora and Chihuahua. It is seldom more than 12 meters high and the trunk reaches a maximum thickness of about 2 dm.

The bark is gray and rough. The round young twigs are either velvety, slightly hairy or quite smooth, and the leaves also vary from smooth to velvety on the under side. The usually 5 or 7 leaflets are thick, narrowly lanceolate, mostly long-pointed, toothed or entire-margined, yellow-green above, somewhat paler beneath, and stalked. The dioecious flowers appear with the leaves, the staminate ones having a minute calyx, the pistillate a rather large and 4-toothed calyx. The samaras are small, 2 to 3 cm. long, spatulate to linear-spatulate, the blunt or notched wing about as long as the round and striate seed-bearing part and decurrent on its sides only to above the middle.

The wood is light brown, rather weak, with a specific gravity of 0.68; it is used for tool-handles and in wagon-making. The tree is much planted in the southwest for shade and ornament. It is described and illustrated by Professor Sargent (*Silva N. A.* 6: 41) as *Fraxinus velutina* Torrey, but that is a different species to which the name *Fraxinus pistaciæfolia* Torrey was later applied, and this name is also sometimes erroneously given to Toumey's ash. The type specimens were collected by Professor J. W. Toumey of the Yale Forest School, at Tucson, Arizona, March and October, 1895.



FIG. 732. — Toumey's Ash.

12. MICHAUX'S ASH — *Fraxinus Michauxii* Britton

Michaux's ash is known to inhabit very wet ground from southern New York to North Carolina, and probably has a much wider range, but it has been so much confused with other species as to require much further investigation necessary to accurately determine its geographic distribution. It attains a height of at least 13 meters, and a trunk diameter of 3 dm. or more.



FIG. 733. — Michaux's Ash.

The bark, like that of related species, is rough and fissured, and the young twigs are either velvety or smooth. There are 5, 7 or 9 relatively long-stalked leaflets, which are oblong-lanceolate, entire-margined, thick, 13 cm. long or less, 2.5 to 6 cm. wide, dark green above, pale green and more or less hairy beneath, at least along the veins. Like the Red ash its flowers are dioecious. The samaras are broadly spatulate, 3.5 to 5 cm. long, 8 to 10 mm. wide, the thick blunt or notched wing as long

as or longer than the nearly round body and decurrent on its sides to or above the middle.

Specimens which were taken as the type of this species were obtained from a wild tree in the north meadows of the New York Botanical Garden, July 2, 1903. The species was illustrated by Michaux as *Fraxinus tomentosa* Marshall, but his accompanying description applies to *Fraxinus pennsylvanica* Marshall, and he cites *Fraxinus pubescens* Lamarck (which is the same as *F. pennsylvanica* Marshall) as a synonym.

13. RED ASH — *Fraxinus pennsylvanica* Marshall

Fraxinus lanceolata Borkhausen

A tree of eastern North America, ranging from Vermont to northern New York and Minnesota, probably extending into Ontario, and southward to Florida, Mississippi, Kansas, and Texas, preferring rich soil in valleys. It attains a maximum height of about 20 meters and a trunk diameter of about 2 meters, old individuals shading a circle whose diameter is about equal to the height of the tree; it is also called Green Ash.

The bark is ridged, up to 2 cm. thick and brown, the young shoots round, gray, and hairy, velvety or smooth. The 5, 7 or 9 leaflets are all stalked, bright green on both sides, but somewhat lighter in color beneath than above, entire-margined or somewhat toothed, usually oblong-lanceolate and pointed, smooth on both sides or hairy at least along the veins beneath. The staminate and pistil-

late flowers are borne on different trees (dioecious), the pistillate with a deeply 4-toothed calyx. The samaras are spatulate to oblong-spatulate, 3 to 5 cm. long, 4 to 7 mm. wide, the blunt, sharp-pointed, or sometimes notched wing about twice as long as the narrow, little flattened seed-bearing part and decurrent on its edges to the middle or below.

The tree is well adapted to street and park planting, and grows rapidly. Its wood has a specific gravity of 0.71, is brown and strong and is much used in carpentry and in wagon-building.

It has been supposed that the so-called Red ash and Green ash could be told apart by the velvety twigs of the former and the smooth ones of the latter, but there is all variety in the amount of hairiness on the twigs, as in some other species, and the leaves and fruits are alike in the two.



FIG. 734. — Red Ash.

14. SMALL'S ASH — *Fraxinus Smallii* Britton, new species

Small's Ash occurs along rivers from Georgia and Florida to Louisiana and Missouri, and has been confused with the Red ash, which it somewhat resembles in foliage, and with the White ash, on account of the plump seed-body of its fruit; but the wing of the samara is clearly decurrent on the sides of the seed-body, which is not the case in the White ash. The tree becomes at least 16 meters high, and then has a trunk diameter of about 6 dm.



FIG. 735. — Small's Ash.

The young twigs are round, gray and smooth in the specimens seen. The leaves have either 5 or 7 oblong-lanceolate to ovate-lanceolate or ovate-oblong, stalked leaflets, which are rather thick, pointed, narrowed or rounded at the base, darker green above than beneath, entire-margined or very little toothed, 8 to 15 cm. long, and more or less hairy on the under side at least along the veins. The samaras are narrowly oblong-spatulate, 3 to 5 cm. long, 5 to 8 mm. wide, the seed-body

oblong or linear-oblong, and about one half as long as the pointed blunt or notched wing, which is decurrent on its sides to about the middle.

The type specimen, contained in the herbarium of Columbia University, was collected by Dr. John K. Small, who has contributed very largely to our knowledge of the plants of the southern States, on the Yellow River, Gwinnett county, Georgia, Aug. 2, 1895. The 3-winged state of the fruit, found also in other species, and due to the ovary being sometimes 3-celled instead of 2-celled, is shown on the type specimen.

15. PUMPKIN ASH — *Fraxinus profunda* Bush

A tall southern swamp tree, known to occur from Missouri, Illinois, and eastern Arkansas to Virginia and Florida, attaining a maximum height of about 40 meters and a trunk diameter of about 1 meter just above the much swollen and buttressed base.



FIG. 736. — Pumpkin Ash.

The rather thick bark is gray and fissured. The young twigs are round, and either velvety or smooth; the large leaves have 7 or 9 oblong-lanceolate to ovate-lanceolate long-pointed leaflets, which are stalked, bright green above, paler and hairy or velvety beneath, entire-margined or nearly so, 1 to 2.5 dm. long, 5 to 13 cm. wide. The flowers are dicecious, in large panicles, the staminate ones with a minutely 4-toothed calyx, and mostly 2 stamens, the calyx of the pistillate ones 4-lobed. The samaras are spatulate to linear-spatulate, 5 to 7.5 cm. long, 8 to 12 mm. wide,

the rather thick, often notched wing longer than the linear somewhat flattened seed-bearing part, and decurrent on its edges to below the middle.

The wood is similar to that of related species.

16. DESERT ASH — *Fraxinus coriacea* S. Watson

An inhabitant of desert regions of Nevada, Utah, Arizona, and southern California, this tree does not exceed 10 or 12 meters in height, with a trunk up to 4 or 5 dm. in thickness.

The twigs are light gray in color, either somewhat hairy or quite smooth. The leaves are 2 dm. long or less, their stalks stout and channelled; they usually have 5 leaflets, sometimes 3, rarely only 1; the leaflets are thick and leathery in texture;

ovate to oblong or ovate-orbicular, 5 to 8 cm. long, 2.5 to 5 cm. wide, long-stalked, strongly veined, toothed from the apex nearly to the base, and vary from abruptly pointed at the tip and wedge-shaped at the base to rounded or blunt at both ends; the upper surface is bright green and smooth, the under side paler and when young often hairy. The diœcious flowers appear with or just before the leaves of the season in April or May in compact clusters. The samaras are narrowly oblanceolate, 2 to 3 cm. long, about 5 mm. wide, the wing decurrent on the seed-bearing part to about the middle, and either blunt, pointed or notched at the apex.



FIG. 737. — Desert Ash.

17. TEXAS ASH — *Fraxinus texana* (A. Gray) Sargent

Fraxinus americana texana A. Gray

This tree inhabits bluffs and hillsides of central and western Texas. It sometimes reaches a height of 16 meters and a trunk diameter of about 1 meter. The



FIG. 738. — Texas Ash.

bark is thick, gray and rough, the young twigs round, and smooth or very nearly so from the first. The leaves have 5, or sometimes 7, long-stalked leaflets, which are ovate to oval in form, or sometimes broader above than below the middle; they are blunt or short-pointed, 5 to 7 cm. long, 3 to 5 cm. wide, narrowed or rounded at the base, bluntly-toothed or nearly entire-margined, dark green above, pale beneath. The diœcious flowers appear with the leaves in early spring, the calyx of the pistillate ones being very deeply 4-lobed. The samaras are small, spatulate to oblong-spatulate, 1.5 to 2.5 cm. long, the blunt or notched wing nearly terminal on the plump marginless seed-bearing part, and equaling it in length, or longer.



FIG. 739. — American Ash, New York Botanical Garden.

The wood is hard, strong and brown, with a specific gravity of 0.76, and is locally used in carpentry. The species is closely related to the White ash (*Fraxinus americana* Linnaeus).

18. WHITE ASH — *Fraxinus americana* Linnaeus

The White ash, or Canadian ash as it is often called, ranges from Nova Scotia to Minnesota, and southward to Florida, Kansas, and Texas. It prefers rich soil on hillsides, attaining a maximum height of about 40 meters, and a trunk diameter of 2 meters. Its bark is thick, gray-brown and fissured.

Its young twigs and leaf-stalks are smooth or nearly so, but the under surfaces of the leaflets, which are much paler than the upper surfaces, vary from smooth to quite hairy. The leaves usually have 7 leaflets (5 to 9); these are sharp-pointed, lanceolate to obovate, finely toothed or entire-margined, and 7 to 15 cm. long. The staminate and pistillate flowers are usually borne on different trees (diœcious), but they are occasionally found in the same



FIG. 740. — White Ash.

cluster (monœcious). The samaras are spatulate to nearly linear, 2 to 5 cm. long, the seed-bearing part plump, round in section (terete) and marginless, the wing arising near its top and twice to four times its length.

The tree is of rapid growth, usually free from fungus diseases and from insect depredations; it is thus well adapted to street and park planting, the chief drawback of the Ashes for these purposes being the lateness of the leaves to unfold in the spring and their early falling away in the autumn. Its wood is light brown, strong, tough, with a specific gravity of 0.65, and is largely utilized in building, for handles of tools, implements and furniture.

19. BILTMORE ASH — *Fraxinus biltmoreana* Beadle

This relative of the White ash is known to grow from southern Pennsylvania to Georgia. It was distinguished from *Fraxinus americana* by Mr. C. D. Beadle in 1898, in the course of his studies of trees about Biltmore, North Carolina.

It differs from this tree in having the young twigs, leaf-stalks and leaf-axis permanently rather densely hairy, and the 7 to 9 large leaflets are very hairy on the under side in all the specimens seen by us. The diœcious flowers are in more or less hairy panicles, the staminate ones with a very small, minutely toothed



FIG. 741. — Biltmore Ash.

height of 6 to 8 meters, and a maximum trunk diameter of about 2 dm.

The slender round twigs and the leaves are smooth; there are 3, 5 or 7 slender-stalked leaflets, which vary in shape from ovate to narrowly lanceolate, and from entire to serrate; they are dark green on the upper surface, paler and minutely pitted on the under side, 2 to 7 cm. long, 5 to 20 mm. wide, and often long-pointed. The flowers are borne in loose clusters at leaf scars of the previous year, and are perfect, that is, there are both stamens and a pistil in each one; the small calyx is sharply 4-toothed; there are 4 long narrow white strap-shaped petals about 15 mm. in length, united into a tube at the base which is a little longer than the calyx; the 2 stamens are very short, and almost without filaments. The samaras are broadly oblong to oblong-obovate, about 2 cm. long, 6 to 8 mm. wide, the very flat seed-body about as long as the thin rounded or notched wing, which is decurrent on its edges nearly to the base.

On account of the beauty of its fragrant flowers and of its foliage this tree is planted for ornament in Mexico.

The similar *Fraxinus macropetala*, a shrub recently described by Miss Alice Eastwood, known only in the Grand Cañon of the Colorado River, differs in its linear-oblong samaras, the wing decurrent on the edges of the seed-bearing part about to the middle.

calyx, the pistillate with a larger 4-lobed calyx. Its samaras are larger than those of the White ash, being from 3.5 to 5 cm. long, the narrow terminal wing 2 to 4 times as long as the short-oblong, plump seed-bearing part and very little decurrent upon it.

20. AMERICAN FLOWERING ASH

Fraxinus cuspidata Torrey

This graceful little tree, which is, indeed, often shrubby in habit, is found in rocky soil, especially in cañons, from southwestern Texas to Arizona, extending into northern Mexico. It attains a



FIG. 742. — American Flowering Ash.

21. FRINGE-FLOWERED ASH — *Fraxinus dipetala* Hooker and Arnott

A Californian shrub, not definitely known to form a tree, with spreading stems 4 meters long or less. It ranges from central California southward along the mountains to Lower California.

The young twigs are somewhat 4-sided, and smooth. The leaves are smooth, or very minutely hairy when they first appear, and have from 3 to 9 long-stalked leaflets, which are oval, oblong or oblong-obovate, blunt or pointed, 1.5 to 6 cm. long, 5 to 25 mm. wide, thick, dark green above, rather paler beneath. The flowers are borne in large panicles at the leaf scars of the previous season and are perfect, or rarely polygamous; they have a slightly 4-toothed calyx and 2 white, oblong-obovate blunt petals with short claws; the 2 stamens are about as long as the petals, with slender filaments. The samaras are oblong to oblong-spatulate, 2 to 3 cm. long, 5 to 8 mm. wide, the very flat seed-bearing part striate, the thin, blunt, or notched wing decurrent on its edges to about the middle.

22. GREGG'S ASH — *Fraxinus Greggii* A. Gray

Gregg's ash is a very interesting little tree or large shrub of southwestern Texas and northern Mexico. It attains a maximum height of about 8 meters, when its trunk is about 2 dm. thick.

The bark is thin, gray and scaly. The young twigs are round and minutely hairy, but soon become smooth and gray. The peculiar leaves have the petiole and rachis narrowly wing-margined; the 3 to 7 strictly sessile, small leaflets are spatulate to oblong-obovate, smooth, rather blunt, thick, dark green above, paler and minutely pitted (under a lens) beneath, entire-margined, or few-toothed above the middle, 1 to 2.5 cm. long, 3 to 6 mm. wide, more or less wedge-shaped at the base. The flowers have not yet been obtained by botanists. The samaras are in small clusters in the axils of the leaves, linear or somewhat spatulate, 1.5 to 2 cm. long, about 3 mm. wide, the plump seed-bearing part much shorter than the blunt or notched wing, on which the 2-cleft style is sometimes persistent.



FIG. 743. — Gregg's Ash.

II. FORESTIERA

GENUS **FORESTIERA** POIRETSpecies **Forestiera acuminata** (Michaux) Poiret*Adelia acuminata* Michaux

SMALL tree or shrub, sometimes called Privet, growing along river banks from southern Illinois to Missouri, southward to Georgia and Texas; it reaches a maximum height of 10 meters, with a trunk diameter of 1.5 dm.

The trunk is much branched, the slender branches somewhat spiny. The bark is about 4 mm. thick, close, and brownish gray, the winter buds ovoid, smooth, 1.5 mm. long. The twigs are slender, slightly angular, somewhat hairy, and yellowish green, becoming round and brownish gray. The leaves are opposite, deciduous, membranous, elliptic-oval or ovate-elliptic, 3 to 10 cm. long, tapering at each end, finely toothed, especially above the middle, light green and smooth; the slender leaf-stalk is 5 to 15 mm. long. The flowers, appearing before the leaves, are diœcious or polygamous, small, yellowish or greenish. The staminate flowers are in short clusters, the pistillate in short panicles; the calyx is wanting or very small and 4-toothed; the corolla is usually wanting or composed of 1 or 2 small, deciduous petals; anthers ovate or oblong; ovary ovoid, 2-celled, each cell containing 2 ovules; style slender and terminated by a 2-lobed stigma. The fruit is a drupe, fusiform and curved when young, becoming narrowly oblong, 12 to 15 mm. long, deep purple; stone usually 1-seeded.

FIG. 744. — *Forestiera*.

Its wood is rather soft, not strong, close-grained, yellowish brown and satiny; its specific gravity is about 0.64.

The genus, of which this is the type, consists of about 15 species of trees or shrubs of temperate and tropical America, 8 of which are indigenous to the United States. The name commemorates Charles Leforestier, a French botanist.

Patrick Browne in 1756, named this genus *Adelia*, but as he did not use nor refer to binominal nomenclature, the name is invalid, and was applied by Linnæus three years later to a genus of the Spurge Family.

III. FRINGE TREE

GENUS **CHIONANTHUS** LINNÆUSSpecies ***Chionanthus virginica*** Linnæus

THIS beautiful tree or shrub is indigenous from southern New Jersey and southeastern Pennsylvania to Florida and westward to Tennessee, Arkansas and Texas; it is so well known as to have received many common names, such as Old man's beard, White fringe, American fringe, Flowering ash, and Snowflower tree; its maximum height is 10 meters, with a trunk diameter up to 2.5 dm.

The trunk is short; the branches are stout and ascending. The bark is 6 to 12 mm. thick, fissured into small, thin, close scales of a reddish brown color. The twigs are stout, slightly angled, green, usually hairy, becoming round, smooth, and light brown. The buds are ovoid, sharp-pointed, about 3 mm. long. The stalked leaves are thickish, oval, oblong-elliptic or ovate, 5 to 15 cm. long, rounded, sharp or taper-pointed at each end, yellowish green at first, becoming darker green and shining above, paler and smooth except along the prominent venation beneath; they become bright yellow and fall in the early autumn. The fragrant flowers appear from April to June, dependent upon latitude; they are perfect or polygamous, in axillary, hairy, nodding panicles 1 to 2 dm. long, bracted at each division, the ultimate divisions being 3-flowered; the very small calyx is green, smooth, cup-shaped, deeply 4-lobed; the corolla is 1.5 to 2.5 cm. long, its sharp, linear lobes slightly spreading and joined into a very short tube at the base; the 2, rarely 4, stamens are joined to the base of the corolla-tube, their filaments short and included, the anthers light yellow; the ovary is 2-celled; style short, stout, with a 2-lobed stigma; ovules 2 in each cavity. The fruit, borne in loose clusters, is oblong or oval-oblong, 1.5 to 2 cm. long, dark purple or nearly black, often with a bloom; its skin is thick, the flesh thin and dryish; stone brittle, usually 1-seeded; seed ovate, 16 cm. long.



FIG. 745.—Fringe Tree.

Its wood is close-grained, light brown, with a specific gravity of about 0.64. The bark is sometimes used as a tonic. The Fringe tree is much planted in gardens from Massachusetts southward; its only objectionable feature is the limited time in which it remains in foliage, as it is one of the most tardy to come into full leaf in spring and among the very first to lose its foliage in the autumn.

The genus, of which the Fringe tree is the type, is a small one, only 2 species

being known; the other, also cultivated for ornament and known as the Chinese fringe, *Chionanthus retusa* Paxton, is a native of eastern Asia. The name is the Greek for snowflower, in reference to the white flowers.

IV. DEVILWOOD

GENUS **OSMANTHUS** LOUREIRO

Species ***Osmanthus americana*** (Linnæus) Bentham and Hooker

Olea americana Linnæus



ALSO called Wild olive, this small evergreen tree or shrub of the coastal region from North Carolina to Florida and eastern Louisiana, attains a maximum height of about 15 meters, with a trunk diameter of 3 dm.

The bark is thin and close, scaly, dark gray or reddish gray. The twigs are slender, slightly angular, light reddish brown, becoming round, and gray. The buds are about 12 mm. long, covered by 2 thick scales. The leaves are thick, leathery, narrowly elliptic, lanceolate or oblanceolate, pointed at the apex, nar-



FIG. 746. — Devilwood.

rowed at the base into a short stalk, entire, thick and revolute on the margin, bright green, smooth, and shining above, paler beneath. The flowers are very fragrant, appearing in March in axillary clusters; calyx small, smooth, with 4 stiff, sharp, triangular lobes; the corolla is 4-lobed, 3 to 4 mm. long and whitish; in the pistillate flowers the stamens are reduced, rudimentary or very small; style of the pistillate flowers terminating in a large, slightly exserted stigma; in the staminate flowers, the stigma is reduced to a mere point. The fruit, ripening in early autumn, is oval-ovoid or oval-obovoid, 12 to 18 mm. long, deep purple to blue or yellow-green; its flesh is dry and thin; the ovoid stone contains a single seed.

The wood is hard, dense, close-grained and dark brown; its specific gravity is about 0.81; it is very hard to split, on which account it has received its common name. Its large evergreen leaves and profusion of fragrant small flowers make it worthy of a place in the gardens of warm temperate regions.

The tree of southern Florida has been supposed to differ specifically from that of further north and has been described as *Osmanthus floridana* Chapman; it is said to have more hairy panicles and somewhat larger yellow-green fruit, but these differences do not appear to be constant or definite.

The genus comprises about 12 species, mostly evergreen trees and shrubs of eastern Asia and the Pacific islands; only ours is known to occur naturally in the western hemisphere; several are well known as garden plants in warmer climates, or in the conservatory; *Osmanthus Aquifolium* Siebold and Zuccarini, a holly-like shrub or tree with fragrant, autumnal flowers is frequently grown in the Southern States, and *Osmanthus fragrans* (Thunberg) Louriero, the type species and a native of Japan, is a well-known greenhouse shrub, called Fragrant olive.

The generic name is Greek, with reference to the fragrant flowers.

THE DOGBANE FAMILY

APOCYNACEÆ Lindley



HIS family contains about 130 genera comprising some 1050 species of perennial herbs, shrubs, vines and a few tropical trees; they are widely distributed, but especially abundant in the tropics. They abound in acrid, often milky juices, which make some of the plants of great importance as producers of india rubber; many are very poisonous, but few of them are in general use as medicines, the most important drug being the powerful heart sedative, *Strophanthus*, the seed of *Strophanthus Kombe* Oliver, a native of tropical Africa; many are highly ornamental and found in great variety in conservatories.

The Apocynaceæ have alternate or opposite, simple leaves without stipules. The flowers are perfect, regular, 5-parted and variously clustered. The calyx is inferior, persistent, its lobes imbricated; the 5 lobes of the corolla are often twisted; the stamens are of the same number as the lobes of the corolla, alternate with them, and joined to its tube; the anthers are 2-celled; the ovary is superior, 1-celled with 2 parietal placentas, or 2-celled. The fruit usually consists of 2 follicles or drupes; the seeds are often appendaged; the endosperm is fleshy, the cotyledons straight.

One arborescent species has become naturalized in our area.

OLEANDER

GENUS **NERIUM** LINNÆUS

Species **Nerium Oleander** Linnaeus



LEANDER is a well-known conservatory and house plant, native of the Mediterranean region; it has become naturalized in fields and roadsides in the Gulf States, often becoming a tree 10 meters in height.

The branches are slender, erect, forming a narrow head. The bark is about 6 mm. thick, close, slightly furrowed and dark brown. The twigs are slightly angular, somewhat pithy, smooth, light green, becoming brown and marked by prominent leaf scars. The leaves are opposite, numerous, leathery, narrowly elliptic or linear-elliptic, 6 to 15 cm. long, sharp or taper-pointed at both ends, entire margined, dark green and shining above, paler, with prominent mid-rib, and numerous straight nerves beneath; the leaf-stalk is very short, stout and channelled. The flowers are in terminal, compound cymes; the 5 calyx-lobes are

lanceolate, 5 to 6 mm. long and taper-pointed; the showy corolla is salverform, 3 to 4.5 cm. across, its tube narrowly bell-shaped, the lobes spreading, of various shades of rose and purple or white; the stamens are inserted on the corolla-tube; the anthers are appendaged at the base; there are 2 carpels. The fruit consists of 2 narrow, erect follicles 1 to 2 dm. long. Seeds oblong, flattened, villous.

As an ornamental species the Oleander has been used for ages; in warmer countries it is a common garden and hedge plant and has been planted as a shade



FIG. 747. — Oleander.

tree in southern California. Its most luxuriant growth in America is probably in Bermuda. A great many forms have been developed, as the size, color and doubleness of the flowers. The leaves and bark are poisonous.

The genus consists of about 3 species, all natives of the warmer portion of the Old World. *Nerium odorum* Solander, a very fragrant flowering shrub from Asia, is occasionally seen in conservatories. The name is the ancient Greek name of the Oleander, the generic type, and is supposed to have reference to the moist situations in which it grows naturally.

THE EHRETIA FAMILY

EHRETIACEÆ Schrader



HIS family consists of about 13 genera, with probably 375 species of trees or shrubs of the warmer portions of both hemispheres. In the tropics some of them are valuable as timber trees; a few produce edible fruits and most of them are highly ornamental. In addition to the arborescent genera, one other genus, with a single species, *Coldenia canescens* de Candolle, a low, almost herbaceous plant, occurs on our Mexican border. By some authorities this family is classed as a drupaceous-fruited section of the well-known Borage family.

The Ehretiaceæ have mostly alternate, usually entire, simple leaves without stipules. The flowers are perfect and regular, in compound cymes; the calyx is of 5 or fewer, partly united persistent sepals; the corolla has 5, rarely 4 or 6, partly united deciduous petals or spreading lobes; the stamens are joined to the base of the corolla, of the same number and alternate with its lobes; their filaments are often united at the base; the anthers are introrse; the ovary is 2- to 4-celled or 1-celled, some of the partitions being imperfect; ovules 1 or 2 in each cavity; the styles are 2, distinct or partly united, or 4 and united by pairs. The fruit is drupaceous, its stone having a variable number of seeds, with or without endosperm.

The genera containing our arborescent species are:

Fruit more or less enclosed in the enlarged calyx; styles 4, united by pairs.

1. *Cordia*.

Fruit not enclosed in the calyx; styles 2, more or less united.

Calyx almost closed, valvately 2- to 5-cleft at the apex; fruit of 2 to 4, 1-seeded nutlets.

2. *Bourreria*.

Calyx of 5, slightly united sepals; fruit of two 2-seeded nutlets.

3. *Ehretia*.

I. THE CORDIAS

GENUS **CORDIA** [PLUMIER] LINNÆUS



CORDIA comprises about 200 species of trees, shrubs or vines, indigenous to the warmer regions of both hemispheres, but most abundant in the American tropics. Four species occur in our area, 2 of which are evergreen trees.

The leaves are alternate, usually rough hairy and stalked. The flowers are perfect or polygamous, in terminal, scorpioid cymes or dense spikes or heads, mostly without bracts; the calyx is tubular or bell-shaped, often prominently ribbed, 3- to 5-lobed and accrescent, sometimes entirely enclosing the fruit; the

corolla is variously colored, bell-shaped to salverform, 5-lobed, seldom 4- or 6-lobed, the lobes flat or plaited; the stamens are inserted on the corolla-tube, exserted or included, the filaments thread-like, the anthers various, introrse; the ovary is sessile, 4-celled; styles 4, slender, united by pairs; stigmas club-shaped or capitate. The fruit is a drupe, partly or entirely enclosed by the accrescent calyx and tipped by the style; the flesh is dry or juicy, the enclosed nutlets often quite bony; the seeds mostly 1, rarely 2, are without endosperm, the cotyledons thick and fleshy.

The fruit of some of the species is edible; some are very valuable timber trees in the tropics and many are highly ornamental in flower. The name is in commemoration of Valerius Cordus (1515-1544), a German pharmacist and botanist. *Cordia myxa* Linnæus, of southern Asia, is the type species.

Our arborescent species are:

Flowers pedicelled; corolla orange; calyx smooth, at maturity enclosing the fruit.

1. *C. Sebestena*.

Flowers sessile; corolla white with a yellow center; calyx slightly hairy, partly enclosing the fruit.

2. *C. Boissieri*.

1. GEIGER TREE — *Cordia Sebestena* Linnæus

This small tree occurs in the sandy soils of the Florida Keys, the Bahamas, and other West Indies, to Central America, reaching a maximum height of 10 meters and a trunk diameter of 1.5 dm.

The branches are spreading and ascending, the tree round-topped. The bark is 12 to 15 mm. thick, irregularly ridged, divided into small scales, dark brown to nearly black. The twigs are stout, pithy, round, dark green and covered with rusty hairs, becoming smooth, gray and bearing large leaf scars. The leaves are thick, ovate or oblong-ovate, 8 to 20 cm. long, blunt or sharp-pointed, rounded or slightly heart-shaped at the base, entire or somewhat wavy-toothed, dark green and roughish hairy above, paler and hairy beneath, the leaf-stalk hairy, stout, 3 to 5 cm. long. The flowers, appearing throughout the year, are on short pedicels in open terminal, flat cymes 1 to 2 dm. across; the calyx-tube is cylindric, 1 to 1.5 cm. long, its lobes triangular and short; the corolla is orange-colored, its tube funnellform, twice the length of the calyx, the limb spreading, 2.5 to 4 cm.



FIG. 748. — Geiger Tree.

across, the lobes rounded and irregularly wavy-margined; filaments short, the anthers oblong, included, or in some flowers exserted; the ovary smooth, the style slender, included or exserted. The fruit is ovoid, 2.5 to 4 cm. long, narrowed at the apex and entirely enclosed in the calyx, bright white and smooth; the flesh is thin, the stone irregularly grooved and contains 1 or 2 white seeds about 1.5 cm. long.

The wood is hard, close-grained, dark brown; its specific gravity is about 0.71. This tree is often planted for ornament in tropical countries on account of its abundance of beautiful flowers and showy fruit and is also called *Sebestena* and *Anaconda*.

2. ANACAHUITA — *Cordia Boissieri* A. de Candolle

This small, round-topped, much branched evergreen tree grows but sparingly, and usually only as a shrub, in the limestone soils of Texas and New Mexico, increasing in abundance and size southward, in Mexico, where it attains a height of 8 meters, with a trunk diameter of 2 dm.



FIG. 749. — *Anacahuita*.

The bark is 10 to 12 mm. thick, divided into fibrous ridges of a gray color. The twigs are stout, round and covered with rusty hairs, becoming gray, and only slightly hairy. The leaves are thick and firm, ovate to oblong-ovate, 8 to 12 cm. long, blunt or sharpish-pointed, rounded or heart-shaped at the base, wavy on the margin or entire, dark green, somewhat wrinkled and rough above, brownish velvety beneath; the leaf-stalk is very hairy, stout, 2 to 4 cm.

long. The flowers, appearing from September to June, are nearly sessile, in cymes 1 to 1.5 dm. across; the calyx-tube is broadly cylindric, densely hairy, about 1 cm. long and ribbed; its triangular lobes are sharp-pointed; the corolla is white with a yellow center, its tube funnellform, short hairy on the outer surface, twice the length of the calyx, the limb about 5 cm. across, its lobes nearly orbicular and crisp-margined. The fruit is ovoid, 2.5 to 3 cm. long, light reddish brown, shining, partly enclosed in the calyx; the flesh is sweet and pulpy, the stone smooth, long-pointed.

The wood is soft, close-grained, and brown, its specific gravity about 0.68.

All parts of this plant are aromatic and are used by the Mexicans as cough remedies and have also been widely exploited as cures for consumption. The fruit is also eaten and made into jellies. It is sometimes planted in Mexico for its abundance of beautiful fragrant flowers, which should induce its more general planting in warm climates in which it will thrive.

II. THE STRONGBACKS

GENUS **BOURRERIA** PATRICK BROWNE

BOURRERIA is composed of about 18 species of trees or shrubs, abundant in the West Indies, and peculiar to tropical America, 2 of which enter our area on the Florida Keys.

They have alternate evergreen leaves. The white flowers are in terminal corymbose cymes; the calyx is bell-shaped, persistent, sometimes accrescent, 2- to 5-lobed; the corolla is bell-shaped or funnellform, the tube variable in length, often enlarged at the throat, the 5 lobes broadly ovate and spreading; the stamens are joined to the corolla-tube, the filaments thread-like, the anthers ovate or oblong; the ovary is sessile, incompletely 4-celled, narrowed into a terminal style, which is 2-lobed at the apex; ovules solitary in each cavity. The fruit is a sub-globular drupe, tipped by the base of the style, with a fleshy exocarp enclosing 4 long nutlets, each with a spongy appendage on the back, and flattened on their inner surfaces; the seeds are round and curved, brown, the endosperm fleshy.

The name is in commemoration of J. A. Bourrer, a pharmacist of Nuremberg, Germany, the type species being *B. succulenta* Jacquin, of the West Indies.

Our species are:

Leaves rough above; petioles less than 5 mm. long.

Leaves smooth above; petioles over 10 mm. long.

1. *B. virgata*.

2. *B. havanensis*.

I. ROUGH-LEAVED STRONGBACK — **Bourreria virgata** (Swartz) D. Don

Ehretia virgata Swartz. *Bourreria radula* Chapman, not D. Don

Ehretia radula Chapman, not Poiret

A small tree, but usually a shrub, of the Florida Keys and the West Indies, reaching a maximum height of 13 meters, with a trunk diameter of 2.5 dm.

The bark is about 2 mm. thick, divided into thin scales of a light reddish brown color. The twigs are slender, upright, round and smooth or very nearly so, becoming more or less scaly and dark grayish. The leaves are firm, obovate or oblong-obovate, 2 to 6 cm. long, rounded, blunt pointed, or notched at the apex, wedge-shaped or tapering at the base to a short leaf-stalk, revolute on the margin, dark green and very rough above, pale, smooth and prominently veined beneath. The flowers are in few-flowered cymes 2 to 6 cm. across, on smooth pedicels;



FIG. 750. — Rough-leaved Strongback.

the calyx is bell-shaped, 6 to 7 mm. long, the lobes oblong to ovate or lanceolate-oblong, shorter than the tube; the corolla is white, 1 cm. long, the tube longer than the calyx, its lobes orbicular or kidney-shaped. The fruit is subglobose, 9 to 14 mm. in diameter, subtended by the persistent calyx.

The plant was described and illustrated by Nuttall as *Cordia floridana*, and erroneously stated to have yellow flowers.

2. STRONGBACK — *Bourreria havanensis* (Rœmer and Schultes) Miers

Ehretia havanensis Rœmer and Schultes

Also called Strongbark, this tree inhabits the Florida Keys, the Bahamas, and other West Indies, reaching a height of 12 meters and a trunk diameter of 2 dm., but is often only a bushy shrub.

The trunk is usually short, its branches spreading, round and slender. The bark is about 2 mm. thick, reddish brown. The twigs are slender, round, slightly hairy, soon becoming smooth, red or grayish. The leaves are thick and firm, obovate to oblong or oval-obovate, 4 to 12 cm. long, rounded or notched at the apex, narrowed at the base, entire, revolute on the margin, dark green and smooth above, pale green and prominently reticulate veined beneath; the leaf-stalk is slender, stiff, grooved, 11 to 15 mm. long. The flowers, appearing at almost all seasons, are in terminal cymes 5 to 10 cm. across; pedicels 4 to 12 mm. long; the calyx is bell-shaped, 5 to 6 mm. long, the 5 teeth irregular, blunt; the corolla is about 1 cm. long, its tube slightly longer than the calyx, the spreading lobes nearly orbicular; the fruit is subglobose, 10 to 13 mm. in diameter, capped by the remnants of the style and subtended by the persistent calyx-lobes; the skin is thick and tough, orange-red; the flesh is thin, enclosing 4 thick-walled nutlets.

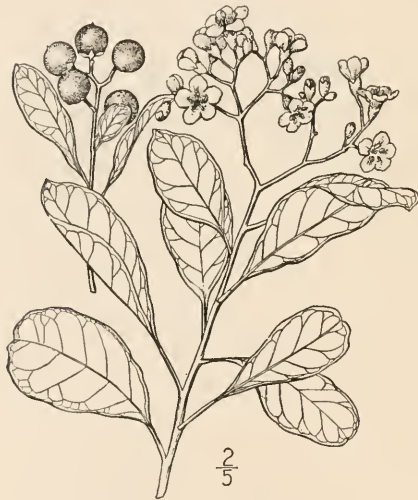


FIG. 751. — Strongback.

The wood is hard, strong, dense and brown; its specific gravity is about 0.80; it is used principally for fuel.

III. THE KNACKAWAY

GENUS **EHRETIA** PATRICK BROWNESpecies **Ehretia elliptica** de Candolle

ALLED Anaqua by the Mexicans, this small tree, often a shrub, of rich valleys or sterile ridges of western Texas and northern Mexico, attains a maximum height of 15 meters, with a trunk diameter of 1 dm.

The branches are stout, spreading, and ascending, the tree round topped. The bark is often 2.5 cm. thick, furrowed into plates, which separate easily into thin, gray or reddish scales. The twigs are round and slender, becoming smooth and reddish brown; there is no terminal bud and the lateral buds are very small. The leaves are thick, somewhat leathery, oblong, oval or oblong-ovate, 3 to 5 cm. long, blunt or sharp-pointed, rounded or narrowed at the base, entire wavy or irregularly toothed on the margin, dark green and rough above, paler and more or less hairy, especially on the veins beneath; the leaf-stalk is short, stout, grooved and hairy. The flowers, which open from autumn to spring, are in compact, hairy cymes 2 to 6 cm. across; the calyx is rough and hairy, deeply divided into 5 lanceolate, sharp-pointed lobes 2 to 2.5 mm. long; the corolla is white, bell-shaped, its tube slightly longer



FIG. 752. — Knackaway.

than the calyx, the limb 7 to 9 mm. across, its lobes thin, ovate and rounded; filaments awl-shaped, exserted, the anthers heart-shaped; the ovary is 1-celled when young; its 2 styles are united for about half their length. The fruit is subglobose, 5 to 8 mm. in diameter, yellow and subtended by the calyx; its flesh is thin, juicy, edible; the 2 nutlets are each 2-seeded; seeds curved, the endosperm fleshy.

The wood is hard, weak, brown, close-grained, its specific gravity about 0.64.

It is often planted as a street tree in western Texas and New Mexico, and admired for its handsome foliage and profusion of flowers.

The genus contains some 50 species of trees or shrubs of the warmer regions of both hemispheres, the type species being *Ehretia tinifolia* Linnæus, of the West Indies. The name is in commemoration of George Dionysius Ehret (1708-1770) a noted German botanical artist.

THE VERVAIN FAMILY

VERBENACEÆ J. St. Hilaire



VERBENACEÆ comprise about 70 genera, including some 1200 species of herbs, shrubs, vines or trees of wide distribution in both temperate and tropical regions throughout the world. Most of the species of the temperate regions are herbaceous; the tropical ones are generally woody; some of the trees, such as Teak, *Tectoria grandis* Linnæus fils, of the East Indies, are important timber producers; many of the herbaceous plants have been used in domestic medicine, but are not of sufficient value to receive professional recognition. Among the most popular garden plants belonging to this family are various species of *Verbena* and *Lantana*, while many other genera are numerously represented in conservatories.

The *Verbenaceæ* have usually alternate leaves; sometimes they are whorled, opposite or clustered, usually simple, seldom compound. The flowers are perfect, more or less irregular; the calyx is inferior, 4- or 5-lobed, persistent, usually subtended by a bractlet; the gamopetalous corolla is 4-lobed or 5-lobed; the stamens are 2 or 4, in 1 or 2 pairs, borne on the corolla-tube and alternate with its lobes; anthers 2-celled, opening longitudinally; the ovary is 2- to 4-celled, rarely 8- to 10-celled; style terminal, the stigma entire or 2- or 4-lobed; ovules solitary or 2 in each cavity. The fruit is dry and separable into 2 or 4 nutlets, or drupe-like or berry-like containing 2 to 4 nutlets; the seed is usually solitary; endosperm wanting, scant or rarely abundant; the embryo is straight. Our arborescent genera are:

Fruit a fleshy drupe; ovary imperfectly 4-celled; seed one in each cavity; leaves pale green.

1. *Citharexylon*.

Fruit a dry capsule; ovary 1-celled; seeds 2 in each cavity; leaves dark above, whitish beneath.

2. *Avicennia*.

I. FIDDLEWOOD

GENUS **CITHAREXYLON** LINNÆUS

Species **Citharexylon cinereum** Linnæus



HIS small evergreen tree or shrub of the sandy soils of Florida also occurs throughout the West Indies, attaining a height of 7 meters or more, with a trunk diameter of 1.5 dm.

The slender branches are ascending. The bark is from 1.5 to 3 mm. thick, close, light reddish brown, quite smooth or separating into small scales.

The twigs are slender, striate, yellowish and smooth or slightly hairy, becoming round and brownish gray. The leaves are thick and leathery, opposite, entire, elliptic, oblong or oblong-obovate, 5 to 15 cm. long, rounded or pointed at the apex, tapering at the base into the short, stout, grooved leaf-stalk, light green, shining and prominently veined. The flowers appear at nearly all seasons, at the ends of the branches, in nodding spike-like racemes 5 to 12 cm. long, on very short pedicels in the axils of small bracts; the calyx is bell-shaped, 3 mm. long, 5-toothed, persistent; the corolla is salverform, white, smooth without, hairy within, its tube slightly longer than the calyx, the limb 5 to 7 mm. across, slightly oblique, its 5 rounded lobes spreading; the 4 stamens are joined to the corolla-tube in sets of 2, separated by a staminode; filaments awl-shaped, included; anthers introrse, opening lengthwise; the ovary is sessile, incompletely 4-celled, tapering into a short, included, 2-lobed style.



FIG. 753. — Fiddlewood.

The fruit is a subglobose drupe, 1 cm. in diameter, reddish brown, shining, its flesh sweet and juicy, subtended by the enlarged, persistent, light brown calyx, the thick, bony stone separable into 2 flattened nutlets, each containing 2 elongated, brown seeds without endosperm.

The wood is very hard, strong, dense and red, its specific gravity about 0.87.

The genus contains about 20 species, all of tropical America, from Florida to Brazil; its name is the Greek translation of the common English name, which is a corruption of the French name "bois fidèle," and has nothing to do with the popular musical instrument. This species has been confused with *Citharexylon villosum* Jacquin, of Santo Domingo. The type of the genus is the little known *Citharexylon spinosum* Linnæus, said to have come from Barbadoes. One other species, *C. brachyanthum* A. Gray, a shrub, occurs in the arid regions of southern Texas.

II. BLACK MANGROVE

GENUS *AVICENNIA* LINNÆUS

Species *Avicennia nitida* Jacquin



ALSO called Black tree and Blackwood, this evergreen tree of low sea-shores along the coast of Florida and the Gulf States to Texas and throughout the coasts of tropical America, varies greatly in stature from a thick, bushy shrub to that of a tall tree, with a maximum height of 25 meters and a trunk diameter of 6 dm.

The bark is from 6 to 12 mm. thick, shallowly fissured into irregular, close scales of a dark brown color; internally it is orange-red. The twigs are stout, slightly angular and finely hairy, becoming round and gray. The leaves are leathery, oblong to oblong-lanceolate 3 to 8 cm. long, blunt or slightly pointed, narrowed to the short, channelled leaf-stalk, thickened and revolute on the margin, somewhat hairy when unfolding, becoming dark green, smooth and often shining, with a grooved midrib above, nearly white and finely hairy beneath. The flowers appear at all seasons, in terminal panicles 2 to 5 cm. long, in the axils of small hairy bracts; the calyx is cup-shaped, silky, its 5 lobes 3 to 4 mm. long, pointed and persistent; the corolla is white, bell-shaped, slightly irregular and hairy, its tube short, nearly cylindric, the limb spreading, 1 to 1.5 cm. across, its



FIG. 754. — Black Mangrove.

4 lobes rounded; the 4 stamens are joined to the upper part of the corolla-tube; anthers introrse; the ovary is sessile, 1-celled, tapering into the short, 2-lobed style. The fruit is an oblique, oblong or elliptic flattened capsule 3 to 5 cm. long, subtended by the persistent calyx, light green and slightly hairy; the seed is without endosperm and usually germinates in the capsule.

The wood is hard, coarse-grained and dark brown; its specific gravity is about 0.91. In the West Indies it is used for sills, and posts, and is very durable in contact with soil. The bark is used in tanning.

The genus contains about 3 species, widely distributed along the coasts of tropical regions. The name is in commemoration of Avicenna of Bokhara (980-1036), a distinguished oriental physician. The generic type is *Avicennia officinalis* Linnæus, of southern Asia and Australasia.



FIG. 755. — Black Mangrove, near Ponce, Porto Rico.

THE POTATO FAMILY

SOLANACEÆ Persoon



HIS family consists of about 70 genera, with some 1600 species of herbs, shrubs, vines and some tropical trees, widely distributed throughout the globe, but most abundant in the tropics. Species of this family furnish some valuable and powerful narcotic drugs such as Belladonna, the leaves or root of *Atropa Belladonna* Linnæus; Henbane, the leaves or seeds of *Hyoscyamus niger* Linnæus; Stramonium, the leaves or seeds of *Datura Stramonium* Linnæus, and the all enslaving tobacco, the leaves of *Nicotiana Tabacum* Linnæus; also a number of food plants as Tomato (*Lycopersicum Lycopersicum* (Linnæus) Karsten), Red Peppers, (*Capsicum annuum* Linnæus), and the Potato and other products of the genus *Solanum*; some are highly ornamental.

The *Solanaceæ* have alternate, rarely opposite, entire or variously divided leaves, usually without stipules. The flowers are in cymes, perfect, regular or nearly so. The calyx is free, usually of 5, sometimes 4 or 6, more or less united, mostly persistent, often accrescent sepals; the corolla is variously shaped and lobed, commonly wheel-shaped and 5-lobed; the stamens are all fertile, of the same number as the lobes of the corolla, alternate with them, and joined to its tube, their filaments equal or unequal; the anthers are usually elongated and open by pores at the apex; the pistil is compound, the ovary superior, usually 2-celled, the styles terminal and united, the stigmas entire or nearly so, the ovules numerous. The fruit is a fleshy berry or dry capsule with 2 or rarely more cavities; the numerous seeds are flattish and crustaceous; the endosperm is fleshy and abundant.

One species occasionally become arborescent in our area.

POTATO TREE

GENUS **SOLANUM** [TOURNEFORT] LINNÆUS

Species ***Solanum verbascifolium*** Linnæus



HIS has recently been found by Dr. J. K. Small, as a low, flat-headed tree in peninsular Florida and on Elliott's Key, where it attains a height of 7.5 meters, with a trunk diameter of 1.5 dm. It is most often a shrub and as such is frequent in the southern States and throughout the West Indies and tropical America.

The bark is about 2 mm. thick, close, roughened by roundish, corky excrescences and gray brown in color. The twigs are stout, pithy and very hairy, especially

when young. The leaves are alternate, thick, elliptic, oblong-obovate or ovate, 1 to 3 dm. long, blunt or taper-pointed, abruptly tapering at the base into the stout leaf-stalk, entire or but slightly wavy-margined, yellowish or grayish green above, pale and prominently veined beneath, thickly velvety throughout. The flowers, appearing throughout the year, are in terminal cymes with long, stout peduncles, on stout, hairy pedicels; the calyx is very hairy, 5 to 6 mm. long, the tube broadly turbinate, its lobes triangular; the corolla is white, 1.5 cm. broad, its lobes ovate or oval-ovate, blunt and hairy; the 5 stamens are joined to the tube of the corolla, their anthers slightly exserted and oblong; ovary 2-celled. The fruit is a subglobose, yellow berry 1 to 2 cm. in diameter; its numerous seeds are dark yellow and somewhat kidney-shaped.



FIG. 756. — Potato Tree.

The wood is hard, close-grained, light yellow and satiny, moderately heavy.

The genus *Solanum* is a very large one, over 900 species of trees, shrubs, herbs or climbers having been described; they are most abundant in the American tropics. It supplies some very valuable food products, as the Potato, which is the root tuber of *Solanum tuberosum* Linnæus, also the Egg plant, *Solanum Melongena* Linnæus. The name is the old Latin one of the Black nightshade, *S. nigrum* Linnæus, the type of the genus, in reference to its quieting properties.

THE FIGWORT FAMILY

FAMILY SCROPHULARIACEÆ Lindley



HIS family comprises about 180 genera containing some 2500 species of herbs, shrubs, and a few trees and climbers, of very wide geographic distribution; they are of no special economic value, although a number of them have medicinal properties and are used in domestic medicine. *Digitalis purpurea* Linnæus, of which the leaves under the name Foxglove are used, is the only one of sufficient value to be recognized in the pharmacopœia. As ornamentals many are well-known plants of our gardens, such as the various species of *Veronica*, *Pentstemon* and *Mimulus*, while the Japanese tree *Paulownia*, often planted for shade, has become naturalized in the eastern States.

The Scrophulariaceæ have simple, opposite, sometimes whorled or alternate leaves, without stipules. The flowers are mostly perfect, irregular and variously clustered; the calyx is free, persistent, 4- or 5-toothed, cleft or divided; the corolla is more or less irregular, generally 2-lipped; the stamens are partly attached to the corolla-tube, 2, 4 or 5 in number, usually in 2 pairs with a fifth sterile one, alternate with the corolla lobes and often appendaged; the ovary is single, superior, 2-celled, with numerous ovules; the style is slender, usually simple; stigma entire or with 2 divisions. The fruit is mostly capsular, 2-valved, rarely berry-like, the seeds very numerous, usually with fleshy endosperm and small embryo.

PAULOWNIA TREE

GENUS **PAULOWNIA** SIEBOLD AND ZUCCARINI

Species ***Paulownia tomentosa*** (Thunberg) Baillon

Bignonia tomentosa Thunberg. *Paulownia imperialis* Siebold and Zuccarini



PAULOWNIA is probably the only arborescent genus of the Figwort Family in the north temperate zone. The genus contains two known species, natives of Japan and China. They have much the aspect of Catalpas, with broad opposite long-stalked hairy leaves and large violet flowers in terminal panicles, which open in late spring before the leaves unfold. *Paulownia tomentosa* has escaped from cultivation and established itself in southern New York and New Jersey, southward to Florida and Texas.

The bark is dark brown and rough, the young twigs brown, hairy, becoming smooth. The branch-buds are small, the flower-buds ellipsoid, velvety, 12 mm.

long. The leaves are broadly ovate, entire-margined or three-lobed, finely hairy on both sides when young, nearly smooth on the upper side when old, 1.5 to 3.5 dm. long. The panicles of flowers are often 3 dm. long, and erect, the flowers about 6 cm. long, their stalks thick and very velvety; the calyx is deeply 5-cleft with short lobes; the corolla is irregular, finely hairy outside, its tube enlarged above, its 5 lobes spreading and somewhat unequal; there are 4 stamens arranged in 2 pairs,



FIG. 757. — Paulownia Tree.

one pair longer than the other, the anther-sacs widely spreading. The ovary is 2-celled with numerous ovules; the style is long, slightly thickened toward the summit and stigmatic on the inner side. The fruit is a large leathery capsule about 5 cm. high and 2.5 cm. thick, ovoid, pointed when ripe, splitting into its cavities and releasing the striate and winged seed.

The genus was named in honor of Anna Paulownia, a Russian princess.

The wood is soft, weak, coarse-grained, yellowish white, its specific gravity 0.25.

THE TRUMPET CREEPER FAMILY

BIGNONIACEÆ Persoon



BIGNONIACEÆ comprise nearly 100 genera, including about 1500 species of trees, shrubs or woody climbers and a few herbs. They are of wide distribution, especially in the tropics, being most abundant in America, but very few occur in the temperate zone; 6 genera with 8 species occur in our area, of which 5 are arborescent. This family includes some important timber trees; the fruit of the Calabash tree is of great importance in tropical countries, being made into basins, pails, cups, and other utensils. Many are exceedingly ornamental and are much used in the gardens of warm climates and in the conservatories of colder countries. In temperate regions a few woody climbers are grown, such as the well-known Trumpet Creeper, *Campsis radicans* (Linnæus) Seemann, native from Pennsylvania southward.

The Bignoniaceæ have opposite, rarely alternate, simple or pinnately compound leaves, the leaf-stalk often provided with tendrils, but there are no stipules. The flowers are mostly spicate or racemose, rarely solitary, large and showy, perfect and more or less irregular. The calyx has usually 2 more or less united lips; the corolla is irregular, deciduous, 5-lobed or 2-lipped, the lobes imbricated; the tube varies from tubular to bell-shaped; stamens 2 or 4, perfect, with 1 to 3 sterile filaments or staminodes often in pairs, inserted on the corolla-tube and alternate with its lobes; filaments thread-like and joined to the corolla-tube, mostly included; anthers 2-celled, the cells commonly diverging; the pistil consists of 2 carpels; ovary 1-celled with 2 parietal placentas or 2-celled by false partition walls; style terminal, usually 2-lobed at the apex and stigmatic on the inner faces of the lobes. The fruit is a leathery or woody capsule, often flattened, elongated and 2-valved. The numerous seeds are usually winged at both ends; the endosperm is wanting; cotyledons usually notched at the apex.

Leaves deciduous; ovary 2-celled; fruit linear, dehiscent.

Leaves mostly opposite, broad; perfect stamens 2.

Leaves alternate or scattered, narrow; perfect stamens 4.

Leaves evergreen, alternate or crowded; ovary 1-celled; fruit ovoid, indehiscent; perfect stamens 4.

1. *Catalpa*.

2. *Chilopsis*.

3. *Crescentia*.

I. THE CATALPAS

GENUS **CATALPA** SCOPOLI

ATALPA consists of about 7 species of trees or shrubs native in Asia and North America. They are of considerable value as timber trees and their bitter bark has been in repute as a remedy for fevers. They are much used and admired as ornamental shade trees.

The leaves are opposite, or whorled, long-stalked, deciduous, membranous, simple, without stipules and of a disagreeable odor when bruised. The large showy flowers are usually white and mottled, borne in terminal panicles or corymbs. The calyx is closed in the bud, broadly 2-lobed; corolla oblique, 2-lipped, the upper lip 2-lobed, the lower 3-lobed; there are 2 perfect stamens, adnate to the base of the corolla and accompanied by three small staminodes; stamens included or exerted, their filaments thread-like, the anthers facing inward, their sacs diverging; ovary 2-celled, sessile on the thick disk; style filiform, terminated by 2 stigmas; the ovules are numerous in several rows on the central placenta. The fruit is a pendent, more or less persistent, dry, much elongated, nearly round capsule, splitting into 2 halves and containing many flat papery, winged seeds which are much broader than long.

The generic name was adapted from the Cherokee Indians' name of the common Catalpa, the type species. Our species are:

Panicles rather dense, many-flowered; corolla 4 to 5 cm. across; leaves short-acuminate.

1. *C. Catalpa*.

Panicles loose, few-flowered; corolla 6 to 8 cm. across; leaves long-acuminate.

2. *C. speciosa*.

1. CATALPA — **Catalpa Catalpa** (Linnæus) Karsten

Bignonia Catalpa Linnæus. *Catalpa bignonioides* Walter

This well-known tree is indigenous on river bottoms in the Gulf States, and has abundantly escaped or become naturalized in the northeast as far as southern New York. Among the most frequently used of its many common names are: Common catalpa, Cataba, Cataba tree, Cigar tree, Indian cigar tree, Indian bean, Bean tree, Smoking bean, and Candle tree. It attains a maximum height of 20 meters, with a trunk diameter of 1.2 m.

Its trunk is short, widely branched, forming a broad spreading tree. The bark is 6 to 8 mm. thick, separating into large plates of a reddish brown color. The twigs are stout, pithy, green to purplish, soon becoming glaucous, thickened at the nodes and bearing the large, roundish leaf scars. The winter buds are lateral, small, globose, the ends of the twigs usually dying back to the first pair of buds. The leaves are opposite or in threes, broadly ovate, 1 to 3 dm. long, short taper-pointed, rounded or heart-shaped at the base, entire or slightly wavy on the margin, sometimes 3-lobed, light green and quite smooth above, somewhat hairy,

prominently veined and glandular beneath; the leaf-stalks are stout, round, about 1 dm. long. The flowers, appearing from May to July, are in many-flowered panicles 2 to 2.5 dm. long, the calyx 8 to 12 mm. long, green or purplish; the white corolla bears 2 rows of yellow spots, the tube bell-shaped, the limb 4 to 5 by 6 to 7 cm. across, the lower lobe nearly entire, with numerous purple spots. The fruit is linear, 1.5 to 4 dm. long, nearly round and dark brown; its walls are thin; it hangs on the branches throughout most of the winter before splitting into 2 halves, exposing a flat-tish partition and numerous seeds, which are about 2 cm. wide, 6 mm. long, nearly white, the wings tufted with whitish hairs.

The wood is soft, weak, coarse-grained, and pale brown; its specific gravity is about 0.45. It is very durable in contact with water and is

much used for fence posts; the bark is used in homeopathic medicine. The tree is much planted for shade and ornament.

2. WESTERN CATALPA — *Catalpa speciosa* Warder

This is a tall tree with a straight, little-branched trunk, of rich river bottom lands of southern Indiana, Illinois, and Missouri, southward into Kentucky, Tennessee, and Arkansas, and has become naturalized about villages in Louisiana and Texas. It has received many common names as Hardy catalpa, Cigar tree, Indian bean, and Shawnee-wood. Its maximum height is about 40 meters, with a trunk diameter of 1.3 m.

The branches are mostly short, forming a relatively narrow tree. The bark is about 2.5 cm. thick, broken into thin scales of a reddish brown color. The twigs are stout, light green, sometimes purplish, sparingly hairy or smooth, becoming reddish brown with a slight bloom, and like its eastern relative, the ends of the twigs are usually winter killed. The leaves are opposite or in threes, thick and firm, ovate or oblong-ovate, 1 to



FIG. 758. — *Catalpa*.

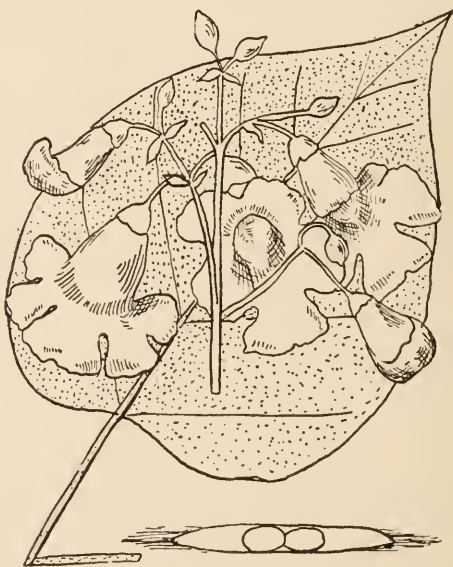


FIG. 759. — Western *Catalpa*.

3 dm. long, acuminate pointed, truncate, or heart-shaped at the base, wavy or angularly lobed on the margin, very hairy when young, becoming smooth and dark green above, paler and softly hairy beneath; the leaf-stalk is often nearly as long as the blade. The flowers, appearing from May to July, are 2 to 3 cm. long, in open, few-flowered panicles 12 to 15 cm. across. The calyx is purplish, its lobes abruptly taper-pointed; the corolla is white, slightly blotched with yellow and an occasional purple spot, 6.5 by 7.5 cm. across; its tube is narrowly bell-shaped, the limb slightly oblique, 2-lipped, the lower lip notched. The fruit is linear, round, 3.5 to 5 dm. long, relatively slender, its walls thick, the partition thickened in the middle; the numerous seeds are 2.5 cm. broad, about 8 mm. long, light brown, the wings fringed with soft hairs.

The wood is soft, weak, coarse-grained, and pale brown; its specific gravity is about 0.42; it is very durable in contact with the soil and water, on which account it is a favorite for railroad ties, to supply which, large tracts in the prairie regions of the west are now planted with these trees. It is also used for fence-posts and furniture as well as inside finish of buildings.

Largely planted for timber, it is also much used for ornamentation and shade in parks and streets on account of its dense, dark foliage and profusion of white flowers.

II. DESERT WILLOW

GENUS **CHILOPSIS** D. DON

Species **Chilopsis linearis** (Cavanilles) de Candolle

Bignonia linearis Cavanilles



DECIDUOUS-LEAVED, small tree or shrub, common on stream banks and in low places in the desert regions from Texas to Arizona, Utah, southern California and adjacent Mexico. It is also called the Texas flowering willow or Flowering willow, and attains a maximum height of 9 meters, with a trunk diameter of 3 dm.

The trunk is short and contorted, the branches slender. The bark is about 6 mm. thick, with irregular ridges and thick scales. The twigs are smooth or hairy and more or less sticky, light brown, becoming dark red-brown or gray with age. The leaves are numerous, opposite or alternate, linear, 1 to 3 dm. long, taper-pointed at each end, entire margined, bright green, somewhat glutinous; the leaf-stalk is very short and slender; they are without stipules. The flowers appear from April to August; they are perfect, showy, disposed in terminal racemes or thyrsoid panicles 6 to 10 cm. long, hairy and subtended by narrow bracts; the calyx is thick, 2-parted and more or less 5-toothed; the white corolla is tinged with yellow or purple, funnelform, somewhat 2-lipped, the upper lip 2-lobed, the lower 3-lobed, the lobes nearly orbicular, about 1 cm. broad, crisp and wavy-margined; the 4 stamens are in 2 pairs with a staminode between, and joined to the corolla-tube; the anthers are spreading; the ovary is sessile, the style filiform, terminated by 2



FIG. 760. — Desert Willow.

stigmas. The fruit persists all winter; it is a dry, thin-walled capsule, narrowly linear, 1 to 3 dm. long and 6 mm. thick, tapering at both ends and splitting into 2 valves. The seeds are 2-ranked, winged and bearded at each end; they are very flat, 1.5 cm. wide, about 8 mm. long, without endosperm; the cotyledons are much broader than long.

The wood is soft, weak, close-grained and dark brown; its specific gravity is about 0.59. This tree is a cheering object on the desert, while its delicate foliage and violet-scented flowers have caused it to be planted in gardens in the southern States and in Mexico.

The genus is monotypic; the name is Greek of obscure meaning.

III. THE CALABASHES

GENUS *CRESCENTIA* LINNÆUS



CRESCENTIA is a tropical American genus consisting of about 6 species of trees, occurring from southern Florida, throughout the West Indies and Central America to Brazil. The genus is best known for the fruit of the Calabash tree, the type species, the hard rind of which is so largely made into utensils throughout tropical America.

The leaves are persistent, alternate, or fascicled, entire, membranous or leathery, without stipules. The large flowers are perfect, solitary or in few-flowered clusters at the axils of the leaves or at the sides of the branches, on stout bracteolate pedicels; the calyx is leathery, splitting into 2 parts, or 5-lobed, and deciduous; the corolla is obliquely and narrowly bell-shaped, pale yellow and streaked with purple, its tube swollen on the lower side, the limb slightly 2-lipped and 5-lobed, the lobes irregularly toothed; the 4 stamens and staminode are joined to the lower part of the corolla-tube, slightly exserted or included, the filaments thread-like, the anthers oblong, spreading; the ovary is sessile, 1-celled, ovoid-conic, tapering into the simple exserted style, its 2 lobes stigmatic on their inner faces; ovules many, on 2 parietal placentas. The fruit is short, indehiscent, berry-like, with a hard rind enclosing a thick, spongy placental mass interspersed with numerous seeds; these are flattened and orbicular.

The name is in commemoration of Pietro de Crescenzi (1233-1320), an Italian agricultural author. The 2 species found in our area are:

- Leaves oblanceolate to spatulate; fruit over 12 cm. long, shell very hard. 1. *C. Cujete*.
 Leaves oblong to obovate-oblong; fruit under 12 cm. long, shell not very hard. 2. *C. latifolia*.

1. CALABASH TREE — *Crescentia Cujete* Linnaeus

This interesting tree is occasionally met with in sandy soil on the Florida Keys; it is a native of the West Indies and is also planted in all tropical American countries. Its maximum height is 10 meters, with a trunk diameter of 2 dm.

The branches are long, wand-like and little divided, forming a very open, irregular head. The bark is about 6 mm. thick, close and silvery gray. The twigs are stout, somewhat angular, light green becoming silvery or creamy white. The leaves are evergreen, leathery, clustered at the ends of the twigs, spatulate or oblanceolate, 0.5 to 1.5 dm. long, rounded and abruptly taper-pointed at the apex, gradually narrowed to the short, stout, winged leaf-stalk, sometimes slightly wavy-margined, bright green above, paler and smooth with prominent veins beneath. The flowers are on short, stout pedicels; the calyx is thick and broad, 2 to 2.5 cm. long, its lobes blunt, a little longer than broad; the corolla is yellowish marked with purple, short-tubular, 5 to 6 cm. long, the lobes crisp, usually sharp-pointed and much shorter than the tube; the fruit is subglobose or oval, 1.5 to 3 dm. in diameter, the rind very hard, its pulp thick and filled with many seeds.

The wood is rather soft, close-grained and flexible; it is sparingly used for saddles, chairs and other furniture. The juice of the unripe fruit is used as a purgative; the pulp of the ripe fruit is made into poultices and is also used as a remedy for coughs, but the most useful portion is the hard rind which is cut and carved into many kinds of domestic utensils.



FIG. 761. — Calabash Tree.

2. BLACK CALABASH — *Crescentia latifolia* Miller

Crescentia cucurbitina Linnaeus

A small evergreen tree of tropical American swamp margins and river banks, from Florida through the West Indies, to southern Mexico and Central America,



FIG. 762. — Calabash Tree, Ponce, Porto Rico.

attaining a maximum height of about 7 meters and a trunk diameter of 1.5 dm.

The branches are long, slender, spreading and drooping, the tree irregularly round-topped. The bark is about 3 mm. thick, brownish or gray, divided into thin scales. The twigs are stout, angular, somewhat enlarged at the nodes and creamy white to dark gray. The leaves are thick and leathery, oblong to oblong-obovate, 7 to 15 cm. long, abruptly pointed at the apex, narrowed to the stout, thick, glandular leaf-stalk, entire and thickened on the margin, dark green with deeply impressed midrib above, a little paler and prominently veined beneath. The flowers are on stalks 2 to 8 cm. long; the calyx is somewhat shorter than the corolla-tube, 2-cleft, the lobes 2.5 to 4 cm. long; the corolla is leathery, purple, or



FIG. 763. — Black Calabash.

whitish and banded, tubular-funnelform, from 5 to 6 cm. long, the veiny tube indented below the limb, which is oblique with a reflexed, slightly 2-lobed upper lip, the lower lip somewhat 3-lobed; the stamens are in 2 pairs of unequal height; the ovary is oblong-conic, contracted into the long, exserted style, which is terminated by 2 flat, ovate stigmas. The fruit, which is suspended on stout, thickened stalks 4 to 6 cm. long, is dark green, oblong to globose, 6 to 10 cm. long, blunt at each end and obscurely 4-ridged; its shell is about 1.5 mm. thick and easily crushed; the numerous seeds are about 2 cm. broad, somewhat shorter, 2-lobed and brown.

The wood is hard, dense, brown or orange-brown; its specific gravity is about 0.63. This species has been confused with *Crescentia ovata* Burmann, an Asiatic tree.

THE MADDER FAMILY

RUBIACEÆ B. Jussieu



RUBIACEÆ comprise some 355 genera including about 5500 species of trees, shrubs or herbs, with entire leaves, round or 4-angled branches with more or less swollen nodes, of wide distribution, but most abundant in the tropics. Some of them are of the greatest economic importance; coffee is the seed of *Coffea arabica* Linnæus; Cinchona bark, probably the most important drug ever discovered, is derived from several members of the genus *Cinchona*, natives of South America, now largely cultivated in the East Indies. Ipecac, another very important drug, is also produced by a member of this family, *Cephælis Ipecacuanha* (Brotero) A. Richard.

The Rubiaceæ have simple, opposite or whorled stipular leaves. The inflorescence is cymose, often paniculate or capitate, the flowers perfect or polygamous, regular or nearly so. The calyx is adnate to the ovary, 4- or 5-toothed, deciduous or persistent; corolla inserted near the top of the calyx-tube, 3- to 6-, rarely 10-lobed; stamens of the same number as the lobes of the corolla, alternate with them and adnate to its tube; filaments somewhat elongated, distinct or united; anthers opening lengthwise; pistil simple or compound, the ovary more or less adnate to the calyx, 2- to 5-celled; styles united; stigmas 2 to many; ovules sometimes solitary, erect, sometimes many. The fruit is a capsule, drupe or berry; the seeds are often flattened on one side, with endosperm, the cotyledons ovate, cordate or leaf-like. Our arborescent genera are:

Fruit dry.

Fruit capsular.

Corolla-lobes oblong, recurved; stamens very little exserted.

Corolla-lobes long-linear; stamens very much exserted.

Fruits forming a dense head.

Fruit fleshy.

Berry large, 5 to 7 cm. long, with numerous seeds.

Drupe small, less than 2 cm. long.

Stone 1, slightly ridged; ovary 4- to 9-celled, ovules pendulous.

Stones 2, prominently ridged; ovary 2-celled, ovules erect.

1. *Pinckneya*.

2. *Exostema*.

3. *Cephalanthus*.

4. *Genipa*.

5. *Guetarda*.

6. *Psychotria*.

I. FEVER TREE

GENUS **PINCKNEYA** MICHAUXSpecies ***Pinckneya pubens*** Michaux

THIS small tree, or more often a shrub, is also called Georgia bark, Quinine bark, and Florida fever bark. It inhabits the wet borders of swamps and streams in the coastal region of South Carolina, Georgia, and Florida, where it is one of the rarest, as well as most elegant of plants when in flower; it attains a maximum height of 9 meters, with a trunk diameter of 2.5 dm.

The branches are mostly slender and spreading. The bark is 6 mm. thick, scaly and light brown. The twigs are round, thickly white-hairy, soon becoming less hairy and red-brown. The deciduous leaves are opposite, membranous, oblong, ovate or oval, 0.5 to 2 dm. long, sharp or abruptly taper-pointed at the apex, tapering at the base, hairy when young, becoming nearly smooth and dark green above, paler and hairy along the stout midrib beneath; the leaf-stalk is stout, 1 to 2 cm. long, with glandular early falling stipules. The large hairy flowers, appearing in May or June, are perfect, in terminal corymbose cymes, on stout, hairy, bracteolate pedicels; the calyx-tube is inverted cone-shaped, 1 cm. long, its lobes linear to linear-lanceolate, 1 to 1.5 cm. long, pinkish, deciduous, or some persisting and becoming remarkably enlarged, leaf-like and pink; the corolla is narrowly tubular, 2 to 3 cm. long, its lobes linear or oblong, blunt-pointed, reflexed, yellowish, marked with brown or purple; stamens 5, opposite the calyx-lobes, little exserted, filiform and free, their anthers oblong, notched at the top and facing inward; ovary 2-celled; ovules numerous in each cell; style filiform, exserted, with a 2-lobed stigmatic apex. The fruit is a round, slightly 2-lobed, 2-celled capsule about 2 cm. long, light brown, opening longitudinally into 2 halves; the seeds are numerous, horizontal, flat, nearly orbicular, thin-winged; cotyledons leaf-like.



FIG. 764. — Fever Tree.

The wood is soft, weak, close-grained and brown; its specific gravity is about 0.53; the bark has been used as a remedy in fevers. It has been sparingly planted

for ornament near its home and would seem to deserve more general use as a garden plant in the southern States.

Its generic name is in commemoration of General Charles Cotesworth Pinckney of South Carolina, an officer in the Revolution, a botanist and chemist. There is but 1 species known.

II. PRINCEWOOD

GENUS **EXOSTEMA** L. C. RICHARD

Species **Exostema caribæum** (Jacquin) Rœmer and Schultes

Cinchona caribæa Jacquin



THIS small, West Indian and Central American tree or shrub occurs on the sandy coast of the Florida Keys, reaching a height of about 8 meters, with a trunk diameter of 3 dm.

The ascending branches are slender, and form an irregular tree; the bark is about 3 mm. thick, gray, deeply fissured into smooth plates. The twigs are round, smooth, green, becoming brown and finally gray. The persistent leaves are opposite, oblong to elliptic or ovate-lanceolate, 4 to 8 cm. long, sharp or taper-



FIG. 765. — Princewood.

pointed at each end, smooth, dark green above, yellowish green and prominently yellow-veined beneath; the leaf-stalk is slender and yellow, 5 to 10 mm. long, the stipules small, triangular. The flowers, opening at any season, are perfect, solitary in the axils of the leaves, on peduncles somewhat shorter than the leaf-stalks; the calyx-tube is narrowly bell-shaped, 4 to 7 mm. long, the 5 lobes triangular and much shorter

than the tube; the white corolla is funnel-shaped, the tube narrow, 3.5 to 4 cm. long, somewhat hairy in the throat, the linear, blunt lobes spreading, nearly as long as the tube; stamens alternate with the corolla lobes, long-exserted, their filaments slender, united at the base; anthers linear-oblong, opening lengthwise; the ovary is inferior, 2-celled; styles united, filiform; stigma entire; ovules numerous. The fruit is an ellipsoid capsule, about 10 mm. long, dark brown, opening into 2 2-parted valves; the numerous seeds are compressed, 3 mm. long, dark brown with a lighter winged margin.

The wood is very hard, strong, close-grained, brown with yellow streaks and satiny; its specific gravity is about 0.93. The bark of this and other species of the genus was once in high repute as a febrifuge, but like the bark of other mem-

bers of this family, it has been superseded by the more reliable *Cinchona* barks and their alkaloids, although it is very nearly related to them, having been originally described as a species of *Cinchona*.

The genus comprises about 20 species, all tropical American; the name is Greek in reference to the long-exserted stamens. *Exostema parviflorum* L. C. Richard, is the type species.

III. BUTTONBUSH

GENUS **CEPHALANTHUS** LINNÆUS

Species **Cephalanthus occidentalis** Linnaeus



SMALL tree or shrub inhabiting swamps and stream banks from New Brunswick to Nebraska, southward to Florida, Texas and northern Mexico; also in Arizona and California; it attains its maximum height of 15 meters, with a trunk diameter of 3 dm. in Arkansas and adjacent Texas.

The crooked branches are outspreading, forming a round top. The bark is about 4 mm. thick, fissured, and splits into narrow scales of a dark brown to nearly black color. The twigs are stout, somewhat angular, pithy, light green and smooth, turning brown and glaucous, and finally dark brown. The buds are generally axillary and very inconspicuous. The deciduous leaves are opposite or in whorls, membranous, oblong, lanceolate or ovate, 7 to 20 cm. long, sharp or sometimes taper-pointed, tapering, rounded or slightly heart-shaped at the base, dark green and smooth above, paler, sometimes slightly hairy and prominently veined beneath; the leaf-stalk is stout, 5 to 15 mm. long. The flowers, opening in spring or summer, are perfect, in axillary or terminal, solitary or paniced, globose heads 2.5 to 5 cm. in diameter, the individual flowers white, in the axils of bracts; the calyx-tube is about 2 mm. long and hairy at the base, the 4 or 5 lobes are short and blunt; the corolla is funnelform, 1 cm. long, smooth or hairy, its 4 lobes ovate and blunt; the 4 stamens are inserted on the throat of the corolla, their filaments short, the anthers oblong; the ovary is 2-celled with a solitary ovule in each cell; the style is filiform, twice the length of the corolla and capped by the stigma. The fruits form a compact globose head 1.5 to 2.5 cm. in diameter; they are crowded, obpyramidal, 7 to 8 mm. long.



FIG. 766. — Buttonbush.

The wood is light, rather hard, moderately close-grained and pinkish brown; the bark is astringent and has been used as a febrifuge. The plant is occasionally used for ornament and deserves to be more extensively planted in wet soil.

The generic name is Greek, meaning head flower. There are about 7 species known, all of which are indigenous to America or Asia, *C. occidentalis* being the type.

IV. SEVEN YEAR APPLE

GENUS **GENIPA** [TOURNEFORT] LINNÆUS

Species **Genipa clusiifolia** (Jacquin) Grisebach

Gardenia clusiifolia Jacquin



SMALL tree or shrub of sandy or rocky coasts of peninsular Florida, the Keys, the Bahamas and Cuba, attaining a height of 7.5 meters, with a trunk diameter of 1.5 dm. It receives its common name from the supposition that it requires seven years in which to mature its fruit, which remains on the branches for a long time.

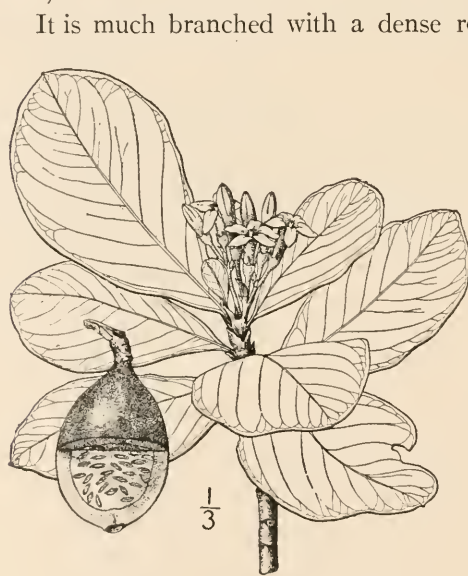


FIG. 767. — Seven Year Apple.

It is much branched with a dense round head. The bark is about 4 mm. thick, white and warty. The twigs are thick, stout and pithy, dull gray and marked by prominent leaf scars. The leaves, which are clustered near the tips of the twigs, are thick and leathery, obovate to wedge-shaped, 5 to 15 cm. long, rounded, notched or pointed, tapering to the short stout leaf-stalk which is 1 to 2 cm. long; they are green and shining above, paler and prominently veined beneath and smooth on both sides. The flowers are white and like the young leaves turn black on drying; they are in close, few-flowered, axillary cymes; the calyx-tube is top-shaped, 8 to 10 mm. long, with 5 or 6 awl-shaped lobes shorter than the tube;

corolla somewhat fleshy, tubular, 1.5 to 2 cm. long, smooth, the lobes spreading, lanceolate or oblong-lanceolate, shorter than the tube; stamens joined to the corolla-tube, their anthers narrow and sessile; ovary 1-celled; style stout. The fruit is a large, thick-skinned, pulpy berry, ovoid to obovoid, 5 to 7 cm. long, scarcely edible; seeds numerous, flattened and angular; the seed coat is rather fibrous.

The wood is hard, close-grained, rich dark brown, sometimes streaked with orange; its specific gravity is about 1.03. It takes a fine polish.

The genus is tropical American, of several species. The type species, *Genipa americana* Linnæus, called Genipa tree, produces an edible fruit which is used in the preparation of marmalade and is sometimes called Marmalade box. The natives of the West Indies called it Genipapo, from which the generic name is derived.

V. THE GUETTARDAS

GENUS **GUETTARDA** LINNÆUS



GUETTARDA includes about 45 species of trees or shrubs, of tropical and warm regions. Aside from some reported tonic properties of the bark they are of no economic value, but several of them are very ornamental, especially *Guettarda hirsuta* Linnæus, of Africa, which is cultivated in tropical gardens and in conservatories for its fragrant white flowers.

They have opposite, rarely whorled, membranous to leathery leaves. The flowers are perfect or polygamo-dioecious, usually in axillary cymes, rarely solitary; calyx-tube cylindric to globose, the lobes usually 4, deciduous or persistent; corolla salverform, elongated, cylindric, smooth in the throat of the tube, the 4 to 9 lobes oblong, acute or rounded; stamens 4 to 9, inserted on the corolla-tube and alternate with its lobes, the filaments short or wanting; anthers attached on the back and introrse; ovary 4- to 9-celled; style stout or thread-like; stigma subcapitate or minutely 2-lobed; ovule solitary and suspended in each cavity. Fruit a drupe, globose, sometimes angled, rarely ovoid, its flesh thin; stone broad, globose or bluntly angled, 4- to 9-celled; seeds straight or curved; endosperm fleshy or none.

The name is in honor of Jean Étienne Guettard (1715-1786), a French naturalist. The type species is *G. speciosa* Linnæus, of Java. Our species are:

Leaves with 4 to 7 pairs of nerves; corolla less than 1 cm. long.

1. *G. elliptica*.

Leaves with 8 to 11 pairs of nerves; corolla over 2 cm. long.

2. *G. scabra*.

1. VELVETSEED — *Guettarda elliptica* Swartz

Also known as Nakedwood, this small nearly evergreen tree of the West Indies is occasionally seen in sandy soil in peninsular Florida and the Keys, where it attains a maximum height of 6 meters, with a trunk diameter of 1.5 dm., usually much smaller and commonly shrubby.

The trunk is short, the thin bark smooth, the branches spreading or drooping, and slender. The twigs are round and slender, covered with long silky hairs at first, soon becoming smooth, red or gray-brown. The leaves are thin and firm, oblong, oval or ovate, 2 to 4 cm. long, blunt and minutely tipped, rounded, narrowed, or somewhat heart-shaped at the base, dark green and slightly hairy above, pale silky hairy with 4 to 7 pairs of prominent nerves beneath; the leaf-stalk is



FIG. 768. — Velvetseed.

stout, about 6 mm. long. The hairy flowers are yellowish white, about 8 mm. long, in few-flowered axillary cymes on hairy slender peduncles mostly shorter than the leaves; calyx-tube cylindric, 2 to 3 mm. long, densely hairy; corolla-lobes oblong or ovate oblong, shorter than the tube and spreading; filaments united to the corolla-tube for a portion of their length; anthers oblong, nearly sessile and included in the corolla-tube. The fruit is a subglobose drupe, 8 to 10 mm. in diameter, dark purple, the flesh thin, dry and sweet; the globose stone is 4- to 8-celled, 1- to 4- seeded.

The wood is hard, dense, reddish brown and satiny; its specific gravity is about 0.83. It is not known to be used except for fuel.

2. ROUGH VELVETSEED — *Guettarda scabra* Ventenat

A small rough-leaved, branching tree or shrub occurring in sandy soils of peninsular Florida, the Keys, and the West Indies, reaching a maximum height of about 6 meters and a trunk diameter of 1.5 dm.

The gray bark is nearly smooth. The twigs are slender, round, rough hairy, light red-brown and marked with large leaf scars. The leathery persistent leaves are oval, oblong-ovate to rhombic-obovate, 2.5 to 8 cm. long, pointed or blunt at the apex, wedge-shaped to heart-shaped at the base, revolute on the margin, very rough above, rusty hairy, 8- to 11-nerved and prominently reticulated beneath; the leaf-stalk is stout, 5 to 15 mm. long; the calyx-tube is densely hairy, 3 to 4 mm. long; the corolla is about 2.5 cm. long, its tube silky hairy, its 5 to 7 lobes are usually oblong. The fruit is puberulent, subglobose, its flesh nearly dry, about 6 mm. in diameter, the stone 4- to 6-celled.

The wood is heavy, hard and dense.



FIG. 769. — Rough Velvetseed.

VI. BALSAMO

GENUS **PSYCHOTRIA** LINNÆUSSpecies **Psychotria undata** Jacquin

SMALL, evergreen tree or branching shrub of wooded places along the coast of southern Florida and the Keys, and very common in the West Indies. It attains a maximum height of about 5 meters.

The twigs are slender, round, usually smooth and green, becoming gray or brown-gray. The leaves are opposite, thin and leathery, oval, elliptic or elliptic-lanceolate, 6 to 15 cm. long, taper-pointed at each end, dark green and shining with impressed venation above, pale, smooth or nearly so, and prominently veined beneath, the leaf-stalk stout and about 1 cm. long; stipules at first con-



FIG. 770. — Balsamo.

spicuous, united and sheath-like, soon falling away. The flowers are usually perfect, in open cymes, the calyx-tube 1 mm. long, the limb 5-toothed; corolla tubular, 2.5 to 3 mm. long, hairy in the throat, its lobes oblong-lanceolate, shorter than the tube; stamens 5, attached to the base of the corolla-tube, their filaments somewhat united; anthers introrse; ovary 2-celled. The fruit is a bright red fleshy drupe, subglobose or ellipsoid, 4 to 4.5 mm. long, containing 1 or 2 prominently ribbed stones.

The genus is a large tropical American one embracing about 400 species of trees or shrubs. One other species, a low branched shrub, *P. tenuifolia* Swartz, also occurs in Florida. The generic name is Greek, meaning vivifying, in reference to the reputed stimulating properties of some of these plants. *P. asiatica* Linnæus, of Jamaica, is the type of the genus, its name misleading.

HONEYSUCKLE FAMILY

CAPRIFOLIACEÆ Ventenat



HIS family includes about 10 genera, comprising upward of 275 species of trees, shrubs, woody climbers, and a few perennial herbs, widely distributed in temperate regions.

The Caprifoliaceæ have opposite leaves, which are either simple or compound and usually without stipules. The inflorescence is axillary or terminal; the flowers, usually in cymes, are regular or irregular, often fragrant and showy; the superior calyx is usually 4- or 5-cleft, and subtended by 2 or more bracts at its base; the gamopetalous corolla is rotate or tubular, the limb 5-lobed or 2-lipped; the 5 stamens are inserted on the corolla-tube and sometimes united with it by their filaments, which are alternate with the divisions of the corolla, their anthers versatile; the inferior ovary has 2 to 5 cells, each containing a solitary pendulous ovule; the slender style is capped by a 2- to 5-lobed stigma. The fruit is a 1- to 5-celled berry, drupe or an indehiscent capsule; the seeds are inverted, their coating often bony, the embryo very small, nearly straight and enclosed in fleshy endosperm.

Ornamentation is the principal utility of plants of this family; the genus *Lonicera*, many species of which are well-known vines and shrubs of our gardens and parks, is one of its largest groups. Many species of the following genera are also used in this way. They are also used in medicine and their fruits to some extent as food.

Leaves pinnate; drupe 2- to 5-seeded.

1. *Sambucus*.

Leaves simple; drupe 1-seeded.

2. *Viburnum*.

I. THE ELDERS

GENUS **SAMBUCUS** [TOURNEFORT] LINNÆUS



SAMBUCUS includes some 20 species of trees, or shrubs, and several herbs. They usually grow in rich moist soil, and are widely distributed in the north temperate zone, and flower in spring or summer.

They have very pithy twigs and branches, and opposite, pinnately compound leaves; the leaflets are more or less toothed on their margins, and usually long pointed. The small white, yellowish or pink flowers are arranged in compound umbel-like or thyrsoïd cymes, their pedicels with 1 or 2 scales; the calyx-tube is

ovoid or turbinate, 3- to 5-toothed or lobed; the corolla is wheel-shaped, regular, and has 3 to 5 lobes; the 5 stamens adhere to the base of the corolla-tube, their slender filaments bearing oblong anthers which open outwardly; the ovary is composed of 3 to 5 cells, each containing a pendulous ovule, and ripens into a berry-like drupe containing 3 to 5 1-seeded nutlets which have a fleshy endosperm nearly as long as the elongated flattish seed; the style is 3- to 5-parted.

These well-known plants are of but slight economic value. The bark and flowers are of some little medicinal repute, and the fruits of some species are eaten or made into wine.

The generic name applied by Linnæus is the Latin name for the Old World Elder, *Sambucus nigra* Linnæus, and is supposed to have reference to some musical instrument that was made of its hollow stem. The arborescent species in our flora are:

Inflorescence ovoid or conic; Pacific coast trees or shrubs; fruit red or scarlet.

Leaflets lanceolate or oblong-lanceolate.

Leaflets oval to obovate.

Inflorescence convex or flat-topped; fruit blue or black.

Foliage and inflorescence hairy, at least when young.

Foliage smooth or very nearly so.

Fruit not glaucous.

Fruit glaucous, with a bloom.

1. *S. arborescens*.

2. *S. callicarpa*.

3. *S. mexicana*.

4. *S. canadensis*.

5. *S. glauca*.

1. SCARLET TREE ELDER — *Sambucus arborescens* Nuttall

This Elder reaches its greatest development of 9 meters in height on the rich bottom lands along streams in the lower valleys of the Columbia and Willamette rivers in Oregon. It also occurs in northwestern California and from Washington north to Alaska, and is often shrubby.

The light red-brown twigs have a thick brownish pith. The leaves are quite large, bright green and smooth on the upper surface, lighter green and more or less hairy, at least on the veins beneath; the 7 to 9 leaflets are lanceolate or elliptic-lanceolate, 7 to 14 cm. long, and about one fourth as wide; they are short-stalked, tapering from about the middle to a long point and to an unequally rounded or narrowed base; the margins are very finely toothed. The thyrsoid cymes are ovoid in outline, about 6 cm. across, and composed of many white to yellowish flowers. The rather



FIG. 771. — Scarlet Tree Elder.

The thyrsoid cymes are ovoid in outline, about 6 cm. across, and composed of many white to yellowish flowers. The rather

small fruit is usually bright scarlet but some plants produce yellow and still others brownish colored fruit.

2. CALIFORNIA TREE ELDER — *Sambucus callicarpa* Greene

This tree, known only from California, where it is quite widely distributed in the Coast Mountains, reaches a maximum height of 8 meters, with a trunk diameter of 3 dm.; it probably extends northward into Oregon, and is often a mere shrub.

The light brown bark is slightly fissured. The young twigs are somewhat hairy, becoming light red-brown with age, and filled with a thick white pith. The young leaves are sparsely covered with stiff hairs and provided with small callous-tipped stipules; the 5 to 9 short-stalked leaflets are thin, oval to oblong-ovate, 5 to 10 cm. long, acute or blunt, quite unequally rounded at the base, and closely and deeply toothed; they are dark green on the upper side and lighter green beneath. The white



FIG. 772. — California Tree Elder.

flowers are densely crowded in the ovoid cymes. The fruit is bright red, about 5 mm. in diameter.

3. MEXICAN ELDER

Sambucus mexicana Presl

This southwestern species, reaching a maximum height of 10 meters, with a trunk diameter of 3 dm., occurs in river valleys and on margins of streams from western Texas westwardly to southern California, and south to southern Mexico; it is also called Elderberry tree.

The light brown bark is about 6 cm. thick and scaly. The twigs are light green, more or less hairy, becoming brownish red. The leaves, borne on stout leaf-stalks 2.5 to 3 cm. long, are usually hairy on both sides, especially so beneath, or become nearly smooth when old. The leaflets, usually 5 in number, are thick and firm, ovate to ovate-lanceo-



FIG. 773. — Mexican Elder.

late, 4 to 12 cm. long and pointed; the base is somewhat wedge-shaped, oblique or slightly rounded, the margins toothed by incurved thick-pointed teeth. The numerous creamy white flowers are borne in flattish pubescent cymes 1 to 2 dm. across; the corolla is 5 to 8 mm. broad, deeply divided into 5 ovate-oblong lobes. The fruit is about 6 mm. in diameter, rather juicy, almost black and without bloom; the seeds are small and rough.

The wood is soft, coarse-grained, and brownish, with a specific gravity of about 0.46. The fruit is eaten by Mexicans and Indians, and the tree is sometimes planted for ornament and shade.

4. AMERICAN ELDER — *Sambucus canadensis* Linnæus

Also called Sweet elder and Elderberry, this species occurs from Nova Scotia to Manitoba, south to Florida, and west to Kansas and Texas. The West Indian plant is also referred to this species. Usually a shrub, it attains the dignity of a tree at the South, where it reaches a height of 6 meters, with a trunk diameter of 3 dm.

The dark brown bark is 3 to 5 mm. thick, brown and fissured into many elongated scales. The thick soft twigs are light brown in color, and filled with a white pith. The winter buds, placed above the triangular leaf scar, are rather small and covered with many scales. The leaves are bright green above, lighter and smooth underneath or with a few silky hairs on the veins; the short-stalked leaflets, usually 7 in number, are 3 to 13 cm. long and about one third as wide, oblong to oval, rounded at the slightly unequal base, taper-pointed and toothed by small, sharp, incurved teeth; the terminal leaflet is generally



FIG. 774. — American Elder.

somewhat broader than the others; the tree in the South frequently has the lower pair of leaflets pinnately divided. The numerous fragrant flowers are borne in broad nearly flat cymes, sometimes 2.5 dm. across; the white corolla is 3 to 5 mm. broad and deeply divided into 5 broadly oblong or oval lobes. The fruit is dark purple to nearly black, 4 to 6 mm. in diameter, with a sweetish purplish pulp enclosing 3 to 5 roughened nutlets.

The flowers, which open late in June and early in July, are used in several ways; freshly gathered they are mixed with batter and baked into cakes; mixed

with saccharine matter they are fermented into "elder-flower wine." The dried flowers are used in decoction as a diaphoretic. The fruit is likewise made into wine, and when mixed with some acidulous fruit, as apples, is made into pies and jellies. The woody stems with the large pith removed have been used as tubes, especially for tapping maple-sugar trees. The bark and root are said to be poisonous.

5. BLUEBERRIED ELDER — *Sambucus glauca* Nuttall

This handsome tree, reaching a maximum height of about 15 meters, with a trunk diameter of 4.5 dm., occurs from the mountain valleys of Utah north to Montana and Vancouver island, and west to southern California. It is often a broad spreading shrub, also called Pale elderberry, Mountain elder, Black elderberry, and Elder.

The trunk is rather tall and straight, the spreading branches forming a round

top. The dark brownish bark is deeply fissured and broken into small angular scales. The twigs, at first green and sparingly hairy, become light brown and smooth, and are filled with a thick white pith. The leaves are yellowish green on the upper side, paler beneath, smooth when mature, thick and firm in texture; they have a grooved leaf-stalk and are often subtended by leaf-like stipules; the 5 to 7 stalked leaflets are 8 to 12 cm. long, lanceolate to oblong, more or less taper-pointed, sharply



FIG. 775. — Blueberried Elder.

toothed, and somewhat unequally rounded or narrowed at the base; the lower pair of leaflets are often more or less pinnately divided. The flowers are borne in rather open, usually 5-rayed flattish cymes 1 to 1.5 dm. across, the corolla 4 to 6 mm. broad and deeply cleft into 5 broadly oval lobes. The subglobose fruit is large, often 7 mm. in diameter, bluish black and covered with a whitish bloom, sweet and juicy.

The wood is soft, weak, and coarsely grained, dark yellow-brown, with a specific gravity of about 0.50. The fruit is probably the best in quality of any of the American elders and is much used for pies, jelly and wine. It is planted

for ornament on the Pacific coast. It seems to us probable that *Sambucus maritima* Greene, from the coast of California, near San Francisco, is a form of this species with small cymes.

The New Mexican elder *Sambucus neomexicana* Wooton, described as arborescent and 3 to 5 meters high, with a trunk up to 10 cm. thick, differs from *S. glauca* by its narrower, longer leaflets and somewhat puberulent peduncles and foliage; its nearly black glaucous fruit is about 7 mm. in diameter. Further observation may prove it to be a distinct species.

II. THE VIBURNUMS

GENUS **VIBURNUM** LINNÆUS



VIBURNUM includes about 100 species of trees and shrubs widely distributed in temperate regions. In addition to the arborescent species, about 15 shrubby ones occur in our area; all have quite showy flowers and their fruits are conspicuous in the autumn. The bark of several is used in medicine and the fruits of some are edible.

The opposite leaves are simple, entire, toothed or lobed, the stipules, if present, very small. The flowers are arranged in compound cymes, with 1 or 2 small scales on their pedicels; they are white, sometimes yellowish, seldom pink, those on the outer rays often much larger and neutral; the calyx-tube is top-shaped or obovoid, its short limb 5-toothed or 5-lobed; the wheel-shaped corolla is regular and deeply 5-lobed; the 5 stamens are inserted on the base of the corolla and terminated by oblong anthers which open outwardly; the 1- to 3-celled ovary contains a solitary pendulous ovule in each cavity. The fruit is an ovoid to globose, sometimes flattened, usually fleshy drupe, containing a single flattened stone, frequently grooved on one or both sides and containing 1 compressed seed, with a small embryo and fleshy endosperm.

The genus was very abundant in former geological times, many fossil remains being found in the Tertiary formations; the species are now especially numerous in northern and eastern North America and Asia, and are of great value for ornamental planting.

The generic name applied by Linnæus to these plants is the old Latin one for the type species, *Viburnum Tinus* Linnæus, of the Mediterranean region. The species that become trees in our area are all more frequently met with as shrubs.

Cyme distinctly peduncled.

1. *V. cassinoides*.

Cyme sessile or very nearly so.

Leaves distinctly petioled, toothed.

Leaves acuminate, serrate.

2. *V. Lentago*.

Leaves obtuse or acute, serrulate.

Leaves smooth or nearly so; stone oblong.

3. *V. prunifolium*.

Leaves more or less red-hairy; stone nearly orbicular.

4. *V. rufidulum*.

Leaves sessile, or indistinctly petioled, entire or irregularly crenate.

5. *V. obovatum*.

1. WITHE ROD — *Viburnum cassinoides* Linnaeus

The Appalachian tea, as it is also called, is usually a shrub, but sometimes becomes a tree 5 meters high; as a shrub it occurs frequently in swamps and wet thickets from Newfoundland to Manitoba south to Florida and Tennessee.



FIG. 776. — Withe Rod.

The ascending branches are rather slender and have a gray bark. The twigs, leaf-stalk and flower-stalks are usually scurfy. The winter leaf-buds are linear, about 1 cm. long, the flower-buds narrowly ovoid, long-tipped. The thick, elliptic to oblanceolate leaves are 5 to 12 cm. long, bright green and smooth or nearly so on the upper side, paler and somewhat scurfy on the veins beneath, abruptly pointed, slightly

scalloped or somewhat wavy on the margin and tapering into a rounded or narrowed base, with a leaf-stalk 1 to 2 cm. long. The many perfect flowers are borne in cymes 5 to 10 cm. across, which are supported on stalks almost as long as the rays; the corolla is white, 4 to 5 mm. broad. The fruit is pink, becoming blue when fully ripe; it is globose to ovoid, 6 to 9 mm. long, with a flattened ovoid stone, and not edible.

Although naturally a swamp shrub, this species often grows well when planted in uplands and is desirable for lawns and parks. It flowers from March to July, according to latitude.

2. SWEET VIBURNUM — *Viburnum Lentago* Linnaeus

Also known as Sheepberry, Sweetberry, Nannyberry, Nanny plum, Nancyberry, Wild raisin, Blackthorn, and Blackhaw, this grows in rich moist soil, especially near streams and swamps, from Ontario to Manitoba and Montana, south to Georgia and Kansas; it frequently becomes a tree, with a maximum height of 10 meters and a trunk diameter of 2.5 dm.

The trunk is short, the slender branches usually drooping. The reddish bark, having a strong, rather disagreeable odor, is broken into thick plates which are less deeply divided into smaller segments. The twigs are light green and, like the leaf- and flower-stalks, are sparingly covered with reddish brown hairs, becoming reddish or orange and scurfy with age. The winter buds, enclosed in 2 large

roughish scales, are long and taper-pointed; those producing flowers are abruptly thickened at the base, 5 to 6 mm. in diameter, and 2 cm. long. The shining bright green leaves are quite smooth on both sides, 5 to 10 cm. long, ovate, elliptic, or nearly orbicular, taper-pointed, toothed by sharp, thick teeth, gradually or abruptly narrowed or rounded at the base, and slender stalked. The flowers are borne in sessile cymes 4 to 12 cm. across; the corolla is white, 5 to 6 mm. broad, deeply 5-lobed. The sweet edible fruit is oval, 10 to 12 mm. long, bluish black, and covered with a bloom; the stone is flat and broadly oval.

The wood is hard, dense, orange-brown; its specific gravity is about 0.73.

The great hardiness, graceful habit, handsome bright green foliage, which passes through various shades of orange and red in the autumn, its numerous clusters of fragrant flowers opening in May and followed by the showy fruit supported on bright red stems and changing through red to blue as the season advances, make this one of the most desirable small trees for ornamental planting.



FIG. 777. — Sweet Viburnum.



FIG. 778. — Black Haw.

3. BLACK HAW

Viburnum prunifolium Linnaeus

Usually a shrub, this sometimes becomes a compact tree with a maximum height of 10 meters and a trunk diameter of 3 dm. It grows in dry woods and thickets from Connecticut to Kentucky, Georgia and Arkansas.

The branches are stiff, spreading, and bear many spine-like twigs. The red-brown bark is about 8 mm. thick and broken into irregular scales. The twigs are somewhat hairy, reddish, then green, and finally become red-brown with age.

The winter buds are covered by 2 dark rough hairy scales; those producing flowers are about 1 cm. long, 5 mm. broad,



FIG. 779. — Black Haw, New York Botanical Garden.

ovoid, and rather gradually contracted to a blunt tip; the leaf buds are much shorter as well as narrower; the rather thin, but firm, usually smooth leaves are 2.5 to 8 cm. long, oval, ovate or obovate, or sometimes nearly orbicular, either sharp or blunt, or sometimes short taper-pointed, very finely toothed; the base is rounded or somewhat narrowed into the short slender stalk. The cymes are 3 to 10 cm. across, sessile or usually so; the corolla is white and 5-lobed. The fruit is 7 to 10 mm. long, oval to subglobose, bluish black with a bloom, sweet and edible after being frosted; the stone is oblong, flat on one side and convex on the other.

The wood is very hard, strong but brittle, reddish brown, with a specific gravity of about 0.83. The bark of the trunk as well as that of the root is astringent and otherwise medicinal and is official in the U. S. Pharmacopœia.

What has been said of the ornamental features of Sweet Viburnum applies equally well to this species. It has somewhat different habit, and smaller leaves with different autumnal coloration. It is also called Stagbush, Sloe, Sheepberry, Nannyberry, Sweet haw, and Haw.

4. SOUTHERN BLACK HAW — *Viburnum rufidulum* Rafinesque

Viburnum rufotomentosum Small

This Black haw, grows in woods and thickets, from Maryland to Florida, Illinois and Kansas to Texas; usually a shrub, it frequently becomes a tree with a maximum height of about 12 meters, and a trunk diameter of 4.5 dm. It is also called Rusty nannyberry.

The rough reddish brown bark exhales a heavy odor when bruised. The twigs are grayish, the ovoid buds are densely covered with short rusty-brown hairs. The leathery leaves vary in outline from ovate-oblong to obovate, some are broadest near the base, others are broadest near the apex, which is usually blunt-pointed; the margins are finely but sharply toothed, the base is narrowed or rounded; they are 7 to 10 cm. long and have a winged leaf-stalk 6 to 15 mm. long, which, like the veins on the under side of the leaf, is thickly covered by red-brown hairs. The flowers are clustered in rather large 3- to 5- rayed cymes, which are sessile or nearly so. The white corolla is 7 to 10 mm. broad, deeply cleft into 5 broadly ovate lobes, which are shorter than the slender stamens with their relatively large anthers. The fruit is an oval drupe 10 to 14 mm. long, of a deep blue color and covered with a bloom. The stone is nearly orbicular.



FIG. 780. — Southern Black Haw.

The bark is used medicinally like that of the Northern black haw, and is sold indiscriminately as such. The plant is hardy as far north as southern New York, and desirable for decorative planting.

5. SMALL VIBURNUM — *Viburnum obovatum* Walter

Although usually a shrub, this sometimes becomes a tree with a slender trunk 9 meters in height.



FIG. 781. — Small Viburnum.

Its dark brown bark is rather rough. The thick leathery leaves are smooth, dark green and shining above, paler on the under side, 2 to 6 cm. long, obovate-cuneate or oblanceolate, slightly scalloped towards the notched or rounded apex, and narrowed into a short leaf-stalk 2 to 4 mm. long. The numerous perfect flowers, which open from April to June, are clustered in small sessile, 3- to 5-rayed cymes 2.5 to 6 cm. across; the white corolla is 5-lobed. The fruit is a black oval drupe 6 to 8 mm. long, enclosing a lenticular stone which is fully as broad as long and somewhat furrowed on both sides.

It occurs in the southern States from Florida northward to Virginia, and gives off a strong scent that is quite characteristic.

NASH'S VIBURNUM — *Viburnum Nashii* Small

This little known species was described from fruiting specimens found in the river swamps of western Florida, where it is a small tree with spreading branches, reaching a height of about 5 meters.

The thick, leathery leaves, more or less clustered on short spur-like branches, are 4 to 5 cm. long, deep green and shining on the upper surface, paler beneath, and vary from spatulate to broadly obovate or suborbicular, the apex blunt or notched, and narrowed at the base into a grooved leaf-stalk; margins more or less scalloped by small rounded teeth. The few-flowered cymes are borne on the ends of the spur-like branches. The shining black fruit is oblong, 10 to 12 mm. long; stone flattened, oblong, much longer than broad.

It apparently differs from the Small Viburnum, mainly in the longer stone of the fruit, and as this is known to vary considerably in other Viburnums, further study is needed to establish its specific distinction.

GLOSSARY OF SPECIAL TERMS

Achene. A dry one-seeded indehiscent fruit with the pericarp tightly fitting around the seed.

Acuminate. Gradually tapering to the apex.

Acute. Sharp-pointed.

Adnate. An organ adhering to a contiguous differing one; an anther attached longitudinally to the end of the filament.

Alternate. Not opposite; with a single leaf at each node.

Ament. A spike of imperfect flowers subtended by scarious bracts, as in the willows.

Androgynous. Flower clusters having staminate and pistillate flowers.

Anther. The part of the stamen which contains the pollen.

Anthesis. Period of flowering.

Apetalous. Without a corolla.

Apiculate. With a minute pointed tip.

Appressed. Lying against another organ.

Arborescent. Forming a tree, or tree-like in size or shape.

Aril. A fleshy organ growing about the hilum of a seed.

Aristate. Tipped by an awn or bristle.

Ascending. Growing obliquely upward, or up-curved.

Auricled (Auriculate). With basal, ear-like lobes.

Axil. The point on a stem immediately above the base of a leaf.

Axile. In the axis of an organ.

Axillary. Borne at, or pertaining to, an axil.

Baccate. Berry-like.

Berry. A fruit with pericarp wholly pulpy.

Bipinnate. Twice pinnate.

Bipinnatifid. Twice pinnatifid.

Blade. The flat expanded part of a leaf.

Bract. A leaf, usually small, subtending a flower or flower-cluster.

Bracteate. With bracts.

Bractlet. A secondary bract, borne on a pedi-

cel, or immediately beneath a flower; sometimes applied to minute bracts.

Caducous. Falling away very soon after development.

Calyx. The outer of two series of floral leaves.

Campanulate. Bell-shaped.

Canescent. With gray or hoary fine pubescence.

Capitate. Arranged in a head; knob-like.

Capsular. Pertaining to or like a capsule.

Capsule. A dry fruit of two carpels or more, usually dehiscent by valves or teeth.

Carpel. The modified leaf forming the ovary, or a part of a compound ovary.

Caudate. With a slender tail-like appendage.

Cell. A cavity, of an anther or ovary; the unit of plant structure.

Chartaceous. Papery in texture.

Chlorophyll. Green coloring matter of plants.

Ciliate. Provided with marginal hairs.

Clavate. Club-shaped.

Cleft. Cut about half-way to the mid-vein.

Confluent. Blended together.

Connate. Similar organs more or less united.

Connective. The end of the filament, between the anther-sacs.

Connivent. Converging.

Convolute. Rolled around or rolled up longitudinally.

Cordate. Heart-shaped.

Coriaceous. Leathery in texture.

Corolla. The inner of two series of floral leaves.

Corymb. A convex or flat-topped flower-cluster of the racemose type, with pedicels or rays arising from different points on the axis.

Corymbose. Borne in corymb; corymb-like.

Cotyledon. A rudimentary leaf of the embryo.

Crenate. Scalloped; with rounded teeth.

Crenulate. Diminutive of crenate.

Crustaceous. Hard and brittle.

Cuneate. Wedge-shaped.

Cuspidate. Sharp-pointed; ending in a cusp.

Cyme. A convex or flat flower-cluster of the determinate type, the central flowers first unfolding.

Cymose. Arranged in cymes; cyme-like.

Deciduous. Falling away at the close of the growing period.

Decom pound. More than once divided.

Decurrent. Applied to the prolongation of an organ, or part of an organ running along the sides of another.

Deflexed. Turned abruptly downward.

Dehiscence. The opening of an ovary, or anther-sac to emit the contents.

Dehiscent. Opening to emit the contents.

Dentate. Toothed, especially with outwardly projecting teeth.

Denticulate. Diminutive of dentate.

Depressed. Vertically flattened.

Diadelphous. Stamens united into two sets.

Dichotomous. Forking regularly into two nearly equal branches or segments.

Dicotyledonous. With two cotyledons.

Diffuse. Loosely spreading.

Digitate. Diverging, like the fingers spread.

Diœious. Bearing staminate flowers on one plant, and pistillate flowers on another of the same species.

Disk. An enlargement or prolongation of the receptacle of a flower around the base of the pistil.

Dissepiment. A partition-wall of an ovary or fruit.

Distichous. Arranged in two rows.

Distinct. Separate from each other.

Divaricate. Diverging at a wide angle.

Divided. Cleft to the base or to the mid-nerve.

Dorsal. On the back, pertaining to the back.

Drupeaceous. Drupe-like.

Drupe. A simple fruit, usually indehiscent, with fleshy exocarp and bony endocarp.

Ellipsoid. A solid body, elliptic in section.

Elliptic. With the outline of an ellipse; oval.

Emarginate. Notched at the apex.

Embryo. A rudimentary plant in the seed.

Endocarp. The inner layer of the pericarp.

Endogenous. Forming new tissue within.

Endosperm. The substance surrounding the embryo of a seed; albumen.

Entire. Without divisions, lobes, or teeth.

Epigynous. Adnate to or borne on the upper part of the ovary.

Erose. Irregularly margined, as if gnawed.

Evergreen. Bearing green leaves throughout the year.

Exfoliating. Peeling off in layers.

Exocarp. The outer layer of the pericarp.

Exogenous. Forming new tissue outside the older.

Exserted. Prolonged past surrounding organs.

Falcate. Scythe-shaped.

Fascicle. A dense cluster.

Fascicled. Borne in dense clusters.

Fastigate. Stems or branches which are nearly erect and close together.

Fertile. Bearing spores, or bearing seed.

Fertilization. The mingling of the contents of a male and female cell.

Filament. The stalk of an anther; the two forming the stamen.

Filiform. Thread-like.

Fimbriate. With fringed edges.

Flexuous. Alternately bent in different directions.

Foliaceous. Similar to leaves.

Foliate. With separate leaflets.

Follicle. A simple fruit dehiscent along one suture.

Follicular. Similar to a follicle.

Free. Separate from other organs; not adnate.

Fugacious. Falling soon after development.

Fugitive. Plants not native, but occurring here and there, without direct evidence of becoming established.

Fusiform. Spindle-shaped.

Gamopetalous. With petals more or less united.

Glabrate. Nearly without hairs.

Glabrous. Devoid of hairs.

Gland. A secreting cell, or group of cells.

Glandular. With glands, or gland-like.

Glaucous. Covered with a fine bluish or white bloom; bluish-hoary.

Globose. Spherical or nearly so.

Glomerate. In a compact cluster.

Glomerule. A dense capitate cyme.

Gregarious. Growing in groups or colonies.

Habit. General aspect.

Habitat. A plant's natural place of growth.

Hastate. Halberd-shaped; like sagittate, but with the basal lobes diverging.

Head. A dense round cluster of sessile or nearly sessile flowers or fruits.

Herbaceous. Leaf-like in texture and color, pertaining to an herb.

Hilum. The scar or area of attachment of a seed or ovule.

Hirsute. With rather coarse stiff hairs.

Hispid. With bristly stiff hairs.

Hyaline. Thin and translucent.

Hypogynous. Borne at the base of the ovary, or below.

Imbricated. Overlapping.

Imperfect. Flowers with either stamens or pistils, not with both.

Incised. Cut into sharp lobes.

Included. Not projecting beyond surrounding parts.

Indehiscent. Not opening.

Inequilateral. Unequal sided.

Inferior. Relating to an organ which arises or is situated below another.

Inflexed. Abruptly bent inward.

Inflorescence. The flowering part of plants; its mode of arrangement.

Integument. A coat or protecting layer.

Internode. Portion of a stem or branch between two successive nodes.

Introrse. Facing inward.

Involucrate. With an involucre, or like one.

Involucre. A whorl of bracts subtending a flower or flower-cluster.

Involute. Rolled inwardly.

Irregular. A flower in which one or more of the organs of the same series are unlike.

Labiate. Provided with a lip-like organ.

Laciniate. Cut into narrow lobes or segments.

Lanceolate. Considerably longer than broad, tapering upward from the middle or below; lance-shaped.

Latex. The milky sap of certain plants.

Leaflet. One of the divisions of a compound leaf.

Legume. A simple dry fruit dehiscent along both sutures.

Lenticular. Lens-shaped.

Limb. The expanded part of a petal, sepal, or gamopetalous corolla.

Linear. Elongated and narrow with sides nearly parallel.

Lobed. Divided to about the middle.

Loculicidal. Applied to capsules which split longitudinally.

Medullary. Pertaining to the pith or medulla.

Mesocarp. The middle layer of a pericarp.

Microspore. The smaller of two kinds of spores borne by a plant, usually giving rise to a male prothallium; pollen-grain.

Midvein (Midrib). The central vein or rib of a leaf or other organ.

Monadelphous. Stamens united by their filaments.

Monœcious. Bearing stamens and pistils on the same plant, but in different flowers.

Mucronate. With a short, sharp, abrupt tip.

Muricate. Roughened with short, hard processes.

Naked. Lacking organs or parts which are normally present in related species or genera.

Naturalized. Plants not indigenous to the region, but so firmly established as to have become part of the flora.

Node. The junction of two internodes of a stem or branch, often hard or swollen, at which a leaf or leaves are usually borne.

Nodose. Similar to nodes or joints; knotty.

Nut. An indehiscent one-seeded fruit with a hard or bony pericarp.

Nutlet. Diminutive of nut.

Obcordate. Inversely heart-shaped.

Oblanceolate. Inverse of lanceolate.

Oblong. Longer than broad, with the sides nearly parallel, or somewhat curving.

Obovate. Inversely ovate.

Obovoid. Inversely ovoid.

Obsolete. Not evident; gone, rudimentary, or vestigial.

Obtuse. Blunt, or rounded.

Orbicular. Approximately circular in outline.

Orthotropous. Term applied to the straight ovule, having the hilum at one end and the micropyle at the other.

Ovary. The ovule-bearing part of the pistil.

- Ovate*. In outline like a longitudinal section of a hen's egg.
- Ovoid*. Shaped like a hen's egg.
- Ovule*. The macrosporangium of flowering plants, becoming the seed on maturing.
- Palmate*. Diverging radiately like the fingers.
- Panicle*. A compound flower-cluster of the racemose type.
- Paniculate*. Borne in panicles or resembling a panicle.
- Papilionaceous*. Term applied to the irregular flower of the Pea Family.
- Papillose*. With minute blunt projections.
- Parasitic*. Growing upon other plants and absorbing their juices.
- Parietal*. Borne along the wall of the ovary, or pertaining to it.
- Parted*. Deeply cleft.
- Pedicel*. The stalk of a flower in a flower-cluster.
- Peduncle*. Stalk of a flower, or a flower-cluster.
- Pedunculate*. With a peduncle.
- Peltate*. Shield shaped; a flat organ with a stalk on its lower surface.
- Perfect*. Flowers with both stamens and pistils.
- Perianth*. The modified floral leaves (sepals or petals), regarded collectively.
- Pericarp*. The wall of the fruit, or seed-vessel.
- Perigynous*. Borne on the perianth, around the ovary.
- Persistent*. Organs remaining attached to those bearing them after the growing period.
- Petal*. One of the leaves of the corolla.
- Petaloid*. Similar to petals; petal-like.
- Petiolule*. The stalk of a leaflet.
- Petiole*. The stalk of the leaf.
- Phyllode*. A bladeless petiole or rachis.
- Pilose*. With long soft hairs.
- Pinna*. A primary division of a pinnately compound leaf.
- Pinnate*. Leaves divided into leaflets or segments along a common axis.
- Pinnatifid*. Pinnately cleft to the middle or beyond.
- Pistil*. The central organ of a flower containing the ovules.
- Pistillate*. With pistils; and usually employed in the sense of without stamens.
- Placenta*. An ovule-bearing surface.
- Plicate*. Folded into plaits, like a fan.
- Plumose*. Resembling a plume or feather.
- Pollen*. *Pollen-grain*. See *Microspore*.
- Polygamous*. Bearing both perfect and imperfect flowers.
- Polypetalous*. With separate petals.
- Pome*. The fleshy fruit of the Apple Family.
- Puberulent*. With very short hairs.
- Pubescent*. With hairs.
- Punctate*. With translucent dots or pits.
- Pyriform*. Pear-shaped.
- Raceme*. An elongated determinate flower-cluster with each flower pedicelled.
- Racemose*. In racemes, or resembling a raceme.
- Rachis*. The axis of a compound leaf, or of a spike or raceme.
- Radiant*. With the marginal flowers enlarged and ray-like.
- Radicl*. The rudimentary stem of the embryo; hypocotyl.
- Raphe (Rhaphe)*. The ridge connecting the hilum and chalaza of an anatropous or amphitropous ovule.
- Ray*. One of the peduncles or branches of an umbel.
- Receptacle*. The end of the flower-stalk, bearing the floral organs; or, in *Compositæ*, bearing the flowers.
- Recurved*. Curved backward.
- Reflexed*. Bent backward abruptly.
- Regular*. Having the members of each part alike in size and shape.
- Reniform*. Kidney-shaped.
- Repand*. With a somewhat wavy margin.
- Reticulate*. Arranged as a network.
- Retorse*. Turned backward or downward.
- Retuse*. With a shallow notch at the end.
- Revolute*. Rolled backward.
- Rhachis*. See *Rachis*.
- Rootstock*. A subterranean stem, or part of one.
- Rostrate*. With a beak.
- Rotate*. With a flat, round corolla limb.
- Rugose*. Wrinkled.
- Sac*. A pouch, especially the cavities of anthers.
- Sagittate*. Like an arrow-head, with the lobes turned downward.

Samara. A simple indehiscent winged fruit.
Scabrous. Rough.
Scale. A minute, rudimentary or vestigial leaf.
Scarious. Thin, dry, and translucent, not green.
Scorpioid. Coiled up in the bud, or in the beginning of growth, unrolling in expanding.
Secund. Borne along one side of an axis.
Segment. A division of a leaf or fruit.
Sepal. One of the leaves of a calyx.
Seplate. Provided with partitions.
Septicidal. A capsule which splits longitudinally into and through its dissepiments.
Serrate. With teeth projecting forward.
Serrulate. Diminutive of serrate; serrate with small teeth.
Sessile. Without a stalk.
Sinuate. With strongly wavy margins.
Sinuous. In form like the path of a snake.
Sinus. The space between the lobes of a leaf.
Spathe. A bract, usually more or less concave, subtending a spadix.
Spatulate. Shaped like a spatula; spoon-shaped.
Spicate. Arranged in a spike; like a spike.
Spike. An elongated flower-cluster or cluster of sporanges, with sessile or nearly sessile flowers or sporanges.
Spinose. With spines, or similar to spines.
Spinule. A small sharp projection.
Spinulose. With small sharp processes or spines.
Spreading. Diverging nearly at right angles; nearly prostrate.
Spur. A hollow projection from a floral organ.
Squarrose. With spreading or projecting parts.
Stamen. The organ of a flower which bears the microspores (pollen-grains).
Staminode. A sterile stamen, or other organ in the position of a stamen.
Standard. The upper, usually broad, petal of a papilionaceous corolla.
Stellate. Star-like.
Sterigmata. The projections from twigs, bearing the leaves, in some genera of Pinacæ.
Sterile. Without spores, or without seed.
Stigma. The summit or side of the pistil to which pollen-grains become attached.
Stipules. Appendages to the base of a petiole, often adnate to it.
Stipulate. With stipules.

Stolon. A basal branch rooting at the nodes.
Stoloniferous. Producing or bearing stolons.
Stoma (Stomata). The transpiring orifices in the epidermis of plants.
Strict. Straight and erect.
Strigose. With appressed or ascending stiff hairs.
Style. The narrow top of the ovary.
Subulate. Awl-shaped.
Succulent. Soft and juicy.
Sulcate. Grooved longitudinally.
Superior. Applied to the ovary when free from the calyx; or to a calyx adnate to an ovary.
Suture. A line of splitting or opening.
Symmetrical. Applied to a flower with its parts of equal numbers.
Syncarp. A fleshy multiple or aggregate fruit.
Terete. Circular in cross-section.
Ternate. Divided into three segments, or arranged in threes.
Thyrsoïd. Like a thyrsus.
Thyrus. A compact panicle.
Tomentose. Covered with tomentum.
Tomentulose. Diminutive of tomentose.
Tomentum. Dense matted wool-like hairs.
Tortuous. Twisted or bent.
Trimorphous. Flowers with stamens of three different lengths or kinds; in three forms.
Truncate. Terminated by a nearly straight edge or surface.
Tuberculate. With rounded projections.
Turbinate. Top-shaped.
Umbel. A determinate, usually convex flower-cluster, with all the pedicels arising from the same point.
Umbellate. Borne in umbels; resembling an umbel.
Uncinate. Hooked, or in form like a hook.
Undulate. With wavy margins.
Urceolate. Urn-shaped.
Valvate. Meeting by the margins in the bud, not overlapping; dehiscent by valves.
Vascular. Relating to ducts or vessels.
Vein. One of the branches of the woody portion of leaves or other organs.
Veinlet. A branch of a vein.
Venation. The arrangement of veins.

- Versatile.* An anther attached at or near its middle to the filament.
- Verticillate.* With three or more leaves or branches at a node; whorled.
- Villous.* With long soft hairs, not matted together.
- Virgate.* Wand-like.
- Whorl.* A group of three similar organs or more, radiating from a node. Verticil.
- Whorled.* See *Verticillate*.
- Winged.* With a thin expansion or expansions.

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